

Government of Karnataka
Department of Technical Education
Board of Technical Examinations, Bengaluru

Course Title : Analog Electronics Circuits	Course Code : 15EC31T
Semester : Third	Course Group : Core
Teaching Scheme in Hrs (L:T:P): 4:0:0	Credits : 4
Type of course : Lecture	Total Contact Hours : 52
CIE : 25 Marks	SEE : 100 Marks

Prerequisites

Basic principles of electrical and electronics engineering and knowledge of semiconductor theory and devices

Course Objectives

1. Understand the concept and applications of regulated power supplies, SMPS and UPS.
2. Understand the concept of amplification, operating point on DC load line and amplifier applications.
3. Study the working principles of different Op-amp circuits.
4. Construct and verify working of basic wave-shaping circuits such as clipping and clamping circuits.
5. Know the different circuits of sinusoidal oscillators and their applications.

Course Outcomes

On successful completion of the course, the students will be able to attain the following COs

Course Outcome		CL	Linked POs	Teaching Hours
CO1	Construct and analyse sub-circuits of DC regulated power supplies	R/U/A	1,2,3,5,6,10	12
CO2	Appraise the applications of SMPS and UPS	R/U/A	1,2,3,5,6,10	12
CO3	Realize amplifier applications of BJT	R/U/A	1,2,3,10	10
CO4	Construct and analyse the Op-amp application circuits	R/U/A	1,2,3,10	07
CO5	Design and analyse active filter circuits	R/U/A	1,2,3,10	06
CO6	Select and analyse simple oscillator circuits and wave-shaping circuits	R/U/A	1,2,3,10	05
Total				52

Legends: PO-Program Outcome, CO-Course Outcome, CL-Cognitive Level, R-Remember, U-Understand, A-Apply

Course-PO attainment matrix

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
Analog Electronics Circuits	3	3	3	--	3	3	--	--	--	3
<p style="text-align: center;">Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed.</p> <p>Method is to relate the level of PO with the number of hours devoted to the COs which address the given PO. If $\geq 40\%$ of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3 If 25 to 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 2 If 5 to 25% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 1 If $< 5\%$ of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed.</p>										

Course content and pattern of marks for SEE

Unit	Unit Name	Teaching Hours	Weightage for CLs in SEE			Marks	Weightage (%)
			R	U	A		
1	Power supplies	12	10	10	10	30	20
2	BJT Biasing and amplifiers	12	10	10	10	30	20
3	OP-AMP and applications	10	05	10	15	30	20
4	Active filters and instrumentation amplifier	07	05	10	10	25	18
5	Wave-shaping circuits	06	05	05	05	15	11
6	Sinusoidal oscillators	05	05	05	05	15	11
Total		52	40	50	55	145	100

Legend: R-Remember, U-Understand, A-Application

Course Contents

Unit 1: Power supplies

12 Hours

DC regulated power supply: Need and block diagram. **Rectifiers:** Ripple Factor, Ripple Frequency, Efficiency, Peak Inverse Voltage. Circuits, operations and waveforms of half-wave and full-wave (centre-tap transformer and bridge) rectifiers. Expressions for ripple factor and efficiency, simple problems. **Filters:** Need for filters in power supplies, working of C and PI filter with waveforms. **Regulators:** Need for voltage regulators in power supplies, working of voltage regulator using Zener diode, line and load regulation. **IC voltage regulators:** Features of 78xx, 79xx, LM 317 ICs. **Basic switching regulator:** Definition, working, step-down and step-up configuration, block diagram of SMPS. **UPS:** Block diagram and working principle of on-line and off-line UPS.

Unit 2: BJT biasing and amplifiers

12 Hours

Biasing: principle of transistor as switch and amplifier, need for biasing, operating point, DC load line, stability factor, voltage divider bias for BJT. **Amplifier features:** direct, RC coupled and Transformer coupled; AF and RF amplifiers; and voltage and power amplifiers. **Feedback in amplifiers:** Types of feedback and their features. **Small-signal Amplifier:** Working of common emitter RC coupled amplifier and its frequency response. **Large-signal**

amplifier: Concept of AC load line, classification and principle of power amplifiers, working of Class A–Series-fed amplifier and transformer-coupled amplifier, Class B- Push-pull amplifier and complementary-symmetry push-pull amplifier, expression for output power and maximum power efficiency of class-A and class-B power amplifiers. Working of Class AB and Class C amplifiers. Comparison of power amplifiers. **Multistage amplifiers:** Concept and expression for voltage gain.

Unit 3: OP-amp and applications

10 Hours

Basic differential amplifier: Working principle. **Op-amp:** Block diagram, ideal and practical characteristics. **Op-amp parameters:** Input offset voltage, input offset current, power supply rejection ratio, CMRR, input and output impedance, gain, gain-bandwidth product, slew-rate. **Open-loop configuration:** comparator, disadvantages of open-loop mode. **Closed-loop configuration:** virtual ground, applications - inverting, non-inverting, voltage follower, summing & difference amplifiers, differentiator, integrator, Schmitt trigger, and concept of precision rectifier. Simple problems.

Unit 4: Active filters and instrumentation amplifier

07 Hours

Active filter: Classification, circuits, working, expressions for cut-off frequencies and frequency response of 1st order Butterworth LPF, HPF, BPF and BEF (No Derivation). Problems to design and analyse 1st order Butterworth filters. Realization of BPF and BEF using LPF and HPF. Mention of applications of active filters. **Instrumentation amplifier:** Need for instrumentation amplifier, working of instrumentation amplifier circuit. **Phase Locked Loop (PLL):** voltage to frequency converter, PLL operation with mention of its applications.

Unit 5: Wave-shaping circuits

06 Hours

RC Circuits: Differentiator and Integrator circuits and their response to sine and square-wave signals. **Clippers:** positive and negative series clippers, positive and negative shunt clippers, combinational clippers and simple problems. **Clampers:** positive and negative clampers. Mention on the applications of clippers and clampers.

Unit 6: Sinusoidal oscillators

05 Hours

Concept of feedback and types, open and closed-loop gains, Barkhausen criteria, LC Tank circuit and stability. Working of Hartley, Collpits and crystal oscillator using BJT. Working of RC phase-shift and Wein-bridge oscillators using Op-amp. Mention on applications and features of these oscillators.

References

1. *Electronic Devices and Circuits*, S. Salivahanan , N. Sereshkumar , McGraw Hill Education (India) Private Limited, ISBN - 9781259051357
2. *Op-amps and linear integrated circuits*, Ramakanth A. Gayakwad, ISBN- 9780132808682
3. *Principles of Electronics*, Rohit Mehta and V K Mehta, S. Chand and Company Publishing, ISBN- 9788121924504
4. *Electronic Devices and Circuits*, David A. Bell, Oxford University Press, ISBN- 9780195693409
5. *Fundamentals of Electrical and Electronics Engineering*, B. L. Theraja, S. Chand and Company Publishing. REPRINT 2013, ISBN-8121926602.

6. e-References/URLS:

<http://www.allaboutcircuits.com/>

<http://www.allaboutcircuits.com/videos>

Course Delivery

The course will be delivered through lectures, presentations and support of modern tools. Student activities are off-class.

Course Assessment and Evaluation Scheme

Master Scheme

Assessment Method	What		To Whom	Assessment mode /Frequency /timing	Max. Marks	Evidence Collected	Course Outcomes
Direct assessment	CIE	IA	Students	Three tests ⁺	20	Blue Books	1 to 6
				Activity*	05	Activity Sheets	1 to 6
	SEE	End exam		End of the course	100	Answer Scripts at BTE	1 to 6
				Total	125		
Indirect assessment	Student feedback on course		Students	Middle of the Course	Nil	Feedback Forms	1 to 3 Delivery of course
	End of course survey			End of the Course	Nil	Questionnaires	1 to 6, Effectiveness of delivery instructions & assessment methods

Legends: CIE-Continuous Internal Evaluation, SEE- Semester End-exam Evaluation

⁺ Every CIE/IA test shall be conducted for 20 marks. Average of three tests, by rounding off any fractional part thereof to next higher integer, shall be considered for CIE/IA.

*Students should do activity as per the list of suggested activities/ similar activities with prior approval of the teacher. Activity process must be initiated well in advance so that it can be completed well before the end of the term.

Questions for CIE and SEE will be designed to evaluate the various CLs as per the weightage shown in the following table.

Sl. No.	Cognitive Levels (CL)	Weightage (%)
1	Remembering	25
2	Understanding	35
3	Applying	40
Total		100

Continuous internal evaluation (CIE) pattern

(i) Student Activity (5 marks)

The following student activities or similar activities can be assigned for assessing CIE/IA

Sl. No.	Activity
1	Design and construct simple application such as door bell/calling bell, blinking LED, burglar's alarm etc. Prepare a report on its design, function, specifications and

	cost estimation.
2	Collect the technical specifications and price of at least 10 electronic components such as diode, transistor etc. and at least 5 electronics equipments such as RPS, UPS, CRO etc.
Execution Note: <ol style="list-style-type: none"> Each batch (Maximum of 2 students) should perform the above activities independently. Students can also choose any other two similar activities/related/ innovative activities with prior approval from the concerned teacher. Teacher is expected to observe, follow-up, and record the progress of students' activities Assessment is made based on quality of work as prescribed by the following rubrics table. 	

(ii) Model of rubrics for assessing student activity (For every student)

Dimension	Scale					Marks (Example)
	1 Unsatisfactory	2 Developing	3 Satisfactory	4 Good	5 Exemplary	
1. Research and gathering information	Does not collect information relate to topic	Collects very limited information, some relate to topic	Collects basic information, most refer to the topic	Collects more information, most refer to the topic	Collects a great deals of information, all refer to the topic	3
2. Full-fills team roles and duties	Does not perform any duties assigned to the team role	Performs very little duties	Performs nearly all duties	Performs almost all duties	Performs all duties of assigned team roles	2
3. Shares work equality	Always relies on others to do the work	Rarely does the assigned work, often needs reminding	Usually does the assigned work, rarely needs reminding	Always does the assigned work, rarely needs reminding.	Always does the assigned work, without needing reminding	5
4. Listen to other team mates	Is always talking, never allows anyone to else to speak	Usually does most of the talking, rarely allows others to speak	Listens, but sometimes talk too much,	Listens and talks a little more than needed.	Listens and talks a fare amount	3
Total marks						ceil(13/4)= 4

(iii) CIE/IA Tests (20 Marks)

Three tests have to be conducted, during specified schedule, in accordance with the test pattern given below and their average-marks shall be considered for CIE/IA.

(iv) Format of CIE/IA test question paper

CIE Question Paper					
Institution Name and Code					
Course Co-ordinator/Teacher					
<i>Program Name</i>		<i>Test No.</i>		<i>Units</i>	
<i>Class/Sem</i>		<i>Date</i>		<i>CL</i>	
<i>Course Name</i>		<i>Time</i>		<i>COs</i>	
<i>Course Code</i>		<i>Max. Marks</i>		<i>POs</i>	
Note to students: Answer all questions					
Question No.	Question	Marks	CL	CO	PO
1					
2					
3					
4					

Legends: PO-Program Outcome, CO-Course outcome, CL-Cognitive Level, R-Remember, U-Understand, A-Apply

Note: Internal choice may be given in each CO at the same cognitive level (CL).

(v) Model question paper for CIE

CIE Question Paper					
Institution Name and Code					
Course Co-ordinator/Teacher					
<i>Program Name</i>	Electronics and Communication	<i>Test No.</i>	1	<i>Units</i>	1 & 2
<i>Class/Sem</i>	3 rd Sem	<i>Date</i>	1/1/2017	<i>CL</i>	R/U/A
<i>Course Name</i>	Analog Electronic Circuits	<i>Time</i>	10-11AM	<i>COs</i>	1 & 2
<i>Course Code</i>	15EC31T	<i>Max. Marks</i>	20	<i>POs</i>	1, 2 & 3
Note to students: Answer all questions					
No.	Question	Marks	CL	CO	PO
1	Define a) Rectification, b) Ripple Factor, c) Ripple frequency, d) Efficiency, and e) Peak Inverse Voltage as applicable to rectifier	05	U/A	1	1,2,3
2	Explain the operation of full-wave bridge rectifier circuit with waveforms. OR Define line and load regulation and illustrate the difference with examples.	05	R/A	1	1,2
3	Define operating point and explain the DC load line as applicable to BJT amplifier	05	R	2	1,2
4	Write CE mode RC coupled amplifier circuit and sketch a typical frequency response curve with labels. OR Illustrate using circuit how crossover distortion can be overcome in complementary-symmetry power amplifier	05	A	2	1,2

Semester end-exam evaluation (SEE)

(i) End-exam question-paper pattern

Unit	Unit Name	Study Duration (Hrs.)	No. Questions for end-exam	
			PART – A 5 Marks	PART – B 10 Marks
1	Power Supplies	12	02	02
2	BJT Biasing and amplifiers	12	02	02
3	OP-amp and applications	10	02	02
4	Active filters and instrumentation amplifier	07	01	02
5	Wave-shaping circuits	06	01	01
6	Sinusoidal oscillators	05	01	01
	Total	52	09 (45 Marks)	10 (100 Marks)

(ii) Model question paper

Course Title : **ANALOG ELECTRONICS CIRCUITS**

Course Code : **15EC31T**

Time : **3 Hrs**

Semester : **Third**

Max. Marks: **100**

Instructions: 1. Answer any **SIX** question from **Part A** (5x6=30 Marks)

2. Answer any **SEVEN** full questions from **Part B** (7x10=70 Marks)

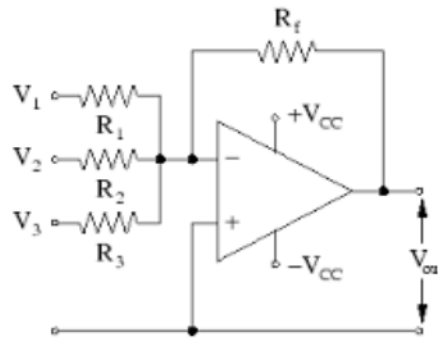
Part A

1. Explain the working of Half-wave rectifier with a relevant circuit and waveforms.
2. Identify the rated output voltages of the following regulator ICs.
a) IC-7805 b) IC-7918 c) IC-7912 d) IC-7815 e) IC-LM317
3. Define biasing and operating point. Match the transistor applications (amplifier, switch-open, switch-close) with different regions on output characteristics of transistor.
4. Explain the working of series-fed class-A amplifier
5. List the ideal and practical characteristics of Op-amp
6. Construct a non-inverting amplifier circuit using Op-amp for a gain of 10
7. Show how to realize BPF using LPF and HPF
8. Construct a shunt clipper circuit to generate a signal having maximum positive amplitude of 2V and negative amplitude of -10V for a sinusoidal input of +10 to -10V.
9. Explain the role of tank circuit in Hartley oscillator; write expression for its frequency of oscillations.

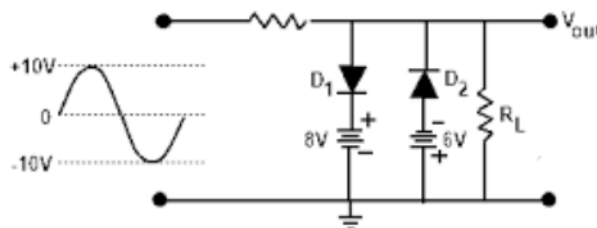
Part B

1. Show mathematically that the efficiency of bridge rectifier is 81.2% and ripple factor is 0.48.
2. a) Define filter. Explain the working of C filter in regulated power supply
b) State the function of UPS. Compare ONLINE and OFFLINE operation of UPS
3. a) In multistage amplifier, illustrate that the overall gain is equal to the product of gains of individual stages

- b) Explain the concept of negative feedback and list its disadvantages?
- (a) Compare the relevance of ac load-line and dc load-line as applicable to amplifiers
(b) Explain the classification of power amplifiers
 - (a) Define any five Op-amp parameters. (b) Construct Schmitt trigger circuit to convert sine wave to square wave
 - (a) In the circuit shown below, if $V_1 = -1V$, $V_2 = V_3 = 2V$, Supply voltage is $\pm 15V$, $R_1 = R_2 = 4K\Omega$, $R_3 = 2K\Omega$, and feedback resistance $R_f = 6K\Omega$, calculate closed-loop gain and output voltage (6)



- (b) Discuss the effect of slew rate on bandwidth in Op-amp applications (4)
- Construct a first-order Butterworth LPF and HPF circuit for a gain of 10, cut-off frequency of 160Hz and an input impedance of 10K Ω . Assume relevant data if necessary.
 - Explain the need and working of an instrumentation amplifier
 - Define clamper and clipper. Write the output wave form for the clipper circuit shown below



- Draw Wein-bridge oscillator circuit for the output frequency of 200Hz.
 - Compare RC phase-shift oscillator with Collpits oscillator.

Institutional activities (No marks)

The following are suggested institutional activities, to be carried out at least one during the semester. The course teacher/coordinator is expected to maintain the relevant record (Containing, Activity name, Resource persons and their details, duration, venue, student feedback, etc) pertaining to Institutional activities.

Sl. No.	Activity
1	Organize seminar, workshop or lecture from experts on the modern trends in analog electronics
2	Organize hands-on practice on design and simulation of analog circuits
3	Motivate students to take case study on different analog electronics-based mini projects (small applications such as applications specified in student activity) to inculcate self and continuous learning

Model Question Bank

Note: The questions in the question bank are indicative but not exhaustive. Sub-questions on different CLs may be combined to frame 10-marks questions or 10-marks questions given here can be splitted into 5-marks questions if necessary keeping weightage of CLs approximately intact and adhering to SEE end-exam pattern.

Unit-1: Power Supplies

Five-mark Questions

REMEMBER

1. State the roles of different sub-circuits of DC regulated power supply
2. Discuss the need for rectifier in DC regulated power supply. Sketch the output waveform of half-wave rectifier for sinusoidal input
3. Define regulator and explain the need for voltage regulators in power supplies
4. Define line and load regulation and discuss the need for quantifying them
5. List any five IC voltage regulators and mention their rated-output voltage levels
6. State the function of filter in DC regulated power supply. Compare PI filter with C filter
7. Differentiate between fixed IC voltage regulators and variable IC voltage regulators
8. List the features of IC-LM 317.

UNDERSTAND

1. Explain the operation of half-wave rectifier circuit with waveforms and circuit
2. Explain the need for filters in power supplies
3. Describe the working of C filter with circuit diagram and waveforms.
4. Explain the working of PI filter with circuit diagram and waveforms
5. Illustrate the need of Zener diode in voltage regulators
6. List the features of switching regulator.
7. Compare LM317 with IC78xx and IC79xx
8. List the components associated with DC regulated power supply
9. Compare online and offline UPS
10. Differentiate DC regulated power supply with SMPS
11. Discuss the need for SMPS and UPS

APPLICATION

1. For the given input $V_i=100 \sin (314t)$, calculate the ripple frequency in half-wave and full-wave rectifiers.
2. Construct the circuit that has highest efficiency in ac to dc conversion
3. Show mathematically the ripple factor of a bridge rectifier is 0.48
4. Explain when IC-7805 and IC-7912 regulators can be used
5. Construct a circuit that minimizes ripples in the output of a rectifier circuit and briefly explain how it does
6. Construct a simple circuit that keeps the output dc voltage almost constant irrespective of variation in the input voltage above certain level.

Ten-mark Questions

REMEMBER

1. Define a) Rectification, b) Ripple Factor, c) Ripple frequency, d) Efficiency, and e) Peak Inverse Voltage
2. List the different functional blocks and their role in SMPS

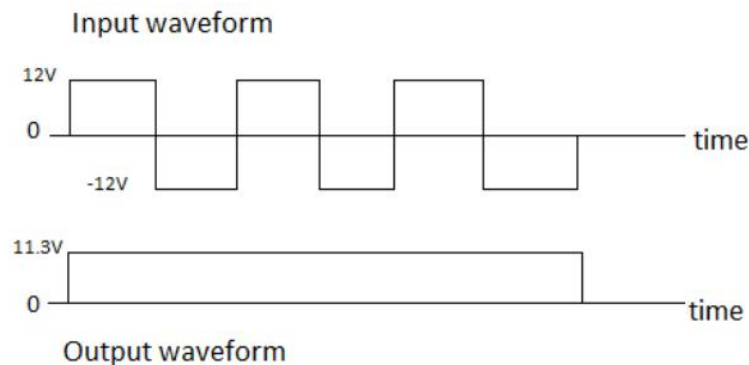
- Define UPS. With a neat block diagram explain the working principle of on-line and offline UPS
- (a) State the purpose of rectifier, regulator, filter, SMPS and UPS.
(b) Describe the working of simple voltage regulator employing Zener diode
- (a) Name the different blocks of DC regulated power supply and state their functions
(b) Define PIV and describe its role in rectifier circuits
- Describe the functioning of bridge rectifier circuit with wave forms and identify the differences with centre-tapped transformer full-wave rectifier.

UNDERSTAND

- Classify the rectifier circuits. Explain the operation of centre-tapped full-wave rectifier circuit with waveforms.
- (a) Summarize similarities and differences of centre-tapped full-wave rectifier and bridge rectifier.
(b) Identify the disadvantages of half-wave rectifier
- (a) Discuss the need for filters and regulators in DC regulated power supplies
(b) Describe the operation of half-wave rectifier circuit with waveforms
- (a) Compare the features of IC-LM 317 with IC78XX series.
(b) Explain briefly the working of step-down and step-up configuration of switching regulator
- (a) Differentiate SMPS and Regulated power supply
(b) Explain the functioning of offline UPS with block diagram

APPLICATION

- (a) Construct a circuit that converts square-wave input to DC output shown in the following figure



- (b) Explain why PIV restricts the dynamic range of the output voltage in rectifier output
- Write the block diagram of DC regulated power supply and sketch the wave forms at the output of each block.
- (a) Illustrate how UPS keeps power supply uninterrupted
(b) List applications of SMPS and DC regulated power supply
- (a) List the disadvantages of half-wave and centre-tap transformer rectifier
(b) Calculate the dc output voltage and ripple factor of a full-wave rectifier given input $V_i = 100 \sin(2 \times 3.1415 \times 50t)$

Unit-2: BJT Biasing and amplifiers

Five-mark Questions

REMEMBER

1. Define amplification, gain, frequency response, bandwidth and input impedance as applicable to amplifiers
2. List the features of RC coupled amplifier
3. Locate the region, on output characteristics plot of BJT, for amplification and switching applications
4. Define biasing of BJT and explain the need for biasing
5. List the differences between Class-A and Class-B power amplifiers

UNDERSTAND

1. Explain the principle of operation of transistor as switch
2. Differentiate between AF and RF amplifiers
3. Differentiate between voltage and power amplifiers
4. Classify the power amplifiers
5. Compare power amplifiers with reference to conduction angle and efficiency
6. Differentiate between small and large-signal amplifiers
7. Explain the principle of operation of transistor as an amplifier
8. Show how individual amplifiers are connected to realise multistage amplifier

APPLICATION

1. Sketch the output of an CE mode RC coupled amplifier having voltage gain of 100 for the given input $v_i=0.01 \sin(31415t)$
2. Four RC coupled amplifiers having gains 3, 6, 2, and 5 are available. Illustrate (block diagram level) how some of these amplifiers can be connected to realise an amplifier with a gain of 30.
3. Identify the power amplifier having highest efficiency and substantiate the reason for it.
4. Sketch the frequency response curve of an RC couple amplifier with relevant labels
5. List the pros and cons of negative feedback in amplifiers
6. Modify Class-B push-pull amplifier to overcome cross-over distortion

Ten-mark Questions

REMEMBER

1. (a) Define operating point and describe the role of DC load line to locate it
(b) List the features of transformer coupled amplifier
2. (a) Describe the working of Class AB amplifier
(b) List the features of RC coupled amplifier
3. (a) Tabulate the efficiencies and conduction angles of power amplifiers
(b) List the features of direct coupled amplifier
4. (a) Describe the concept of ac load line and its role in amplifier design
(b) List various categories of amplifiers and their applications

UNDERSTAND

1. (a) Explain the need for biasing with a brief explanation on voltage-divider bias for BJT amplifier
(b) Differentiate between large signal and small signal amplifiers
2. (a) Explain the concept of feedback and list various feedback methods in amplifiers
3. (a) Explain the working of common emitter RC coupled amplifier
(b) Sketch and label frequency response plot of a typical RC coupled amplifier

4. (a) Explain the working of Class-C amplifier
(b) Relate various power amplifiers with conduction angles and efficiencies
5. (a) Compare the features of Class-B push-pull with Class-AB amplifier
(b) Demonstrate how multistage amplifier can be realised with using individual amplifiers

APPLICATION

1. (a) Sketch output waveform of an RC coupled amplifier having a gain of 50, given input signal $V_i = 0.01 \sin(3140t)$.
(b) Illustrate the use dc load line in amplifier biasing
2. (a) Illustrate how the problems in Class-B push-pull amplifier are solved in complementary symmetry Class B amplifier.
(b) Apply principle of cascading to realise multistage amplifier and determine the expression for gain in terms of individual gains
3. (a) Establish a relation between gains of individual stages and overall gain in a multistage amplifier
(b) List the features of RC coupled amplifier
4. Show that the efficiency of class B amplifier is 78.5% and prepare a table comparing its efficiency with other power amplifiers
5. Show that the total gain is equal to the product of gains of individual stages in a multistage amplifier

Unit-3: OP-AMP and applications

Five-mark Questions

REMEMBER

1. Describe the block diagram of Op-amp
2. List the ideal characteristics of Op-amp
3. Enumerate applications of Op-amp and state their functions
4. List advantages and disadvantages of open-loop mode of Op-amp
5. List any five Op-amp parameters and define them
6. State the functions of integrator, summer, inverting, voltage follower and Schmitt trigger applications of Op-amp

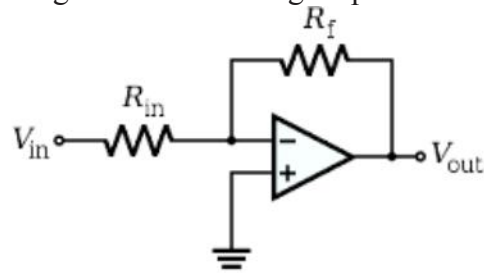
UNDERSTAND

1. Describe the working principle of basic differential amplifier circuit
2. Explain the open-loop configuration of Op-amp as comparator
3. Explain the concept and relevance of virtual ground in Op-amp applications
4. Construct Op-amp circuit having closed-loop gain of -10
5. Sketch the Op-amp circuit that can convert square-wave into pulses with relevant waveforms
6. Discuss the relevance of CMRR and slew-rate on the performance of Op-amp applications
7. Discuss the effect of saturation on the output related to Op-amp applications with example

APPLICATION

1. Sketch an Op-amp circuit that translates sine function into cosine function with the mathematical expression for its output
2. Suggest how voltages can be added and amplified together with the help of Op-amp
3. Sketch the Op-amp voltage follower circuit and mathematically justify its gain is 1
4. Construct an Op-amp circuit that converts square-wave into triangular waveform

5. Construct Op-amp circuit to add two voltages and amplify the sum by 5 times
6. Show mathematically that the gain of an inverting amplifier shown below is $-R_f/R_{in}$



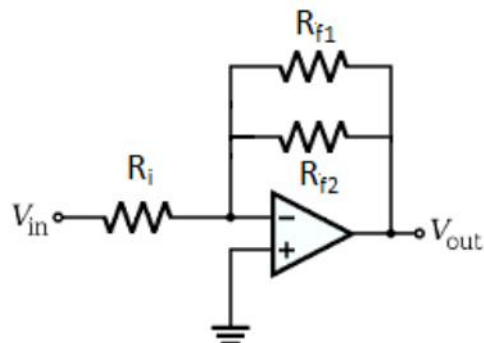
Ten-mark Questions

REMEMBER

1. Define the following terms with reference to Op-amp:
 - a) Input offset voltage, b) Input offset current, c) Power Supply Rejection Ratio
 - d) CMRR, e) Input impedance, f) Output impedance, g) Gain, h) Gain-bandwidth product, i) Slew-rate, j) Saturation
2. (a) List the applications of Op-amp
(b) Describe how to use Op-amp to add voltages
3. (a) Define input impedance, output impedance, bandwidth, open-loop gain and closed – loop gain as applicable to Op-amp application
(b) Name the blocks and their functions of Op-amp
4. (a) Describe how difference amplifier can be realised using Op-amp
(b) Identify the 741 Op-amp pins and their functions

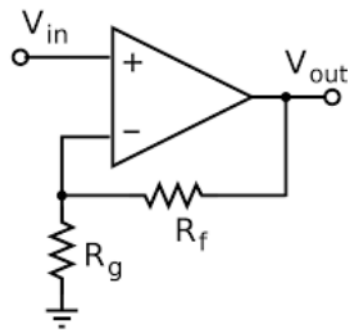
UNDERSTAND

1. Explain the working of Schmitt trigger circuit using Op-amp; also, sketch the hysteresis plot
2. (a) Differentiate integrator and differentiator Op-amp circuits
(b) List the benefits of using Op-amp as an amplifier as compared to BJT
3. (a) Discuss the concept of precision rectification and its realization using Op-amp
(b) Construct Op-amp integrator and sketch its response for sinusoidal input
4. (a) Demonstrate how Op-amp can be used as voltage comparator
(b) Estimate the gain in the following circuit given $R_i=1K\Omega$, $R_{f1}=R_{f2}=10K\Omega$

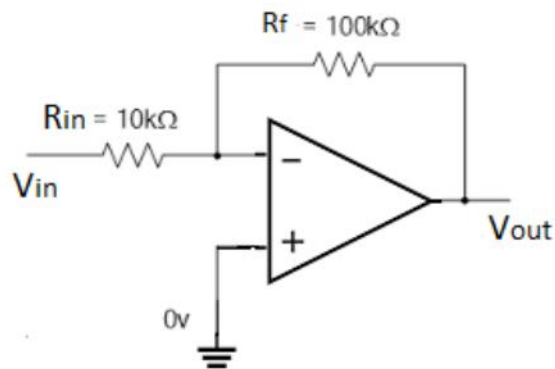


APPLICATION

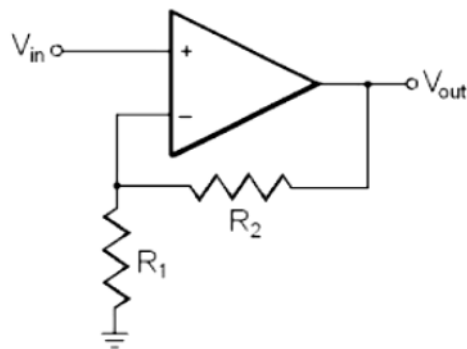
1. (a) Identify the following Op-amp circuit and justify your identification



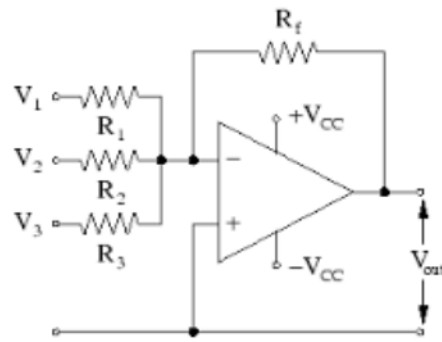
- (b) Modify the Op-amp non-inverting amplifier into voltage follower with justification
- Construct and label an inverting amplifier circuit for a voltage gain of 10 and dynamic output range of -10V to +10V. Sketch its response for the input, $V_i = 15\cos(314t)$.
 - If $V_{in} = 2V$, find the output voltage and voltage gain for the circuit shown below



- (a) If $V_{in} = 2V$, $R_1 = R_2 = 1K\Omega$, find the output voltage and voltage gain for the below circuit.



- (b) Sketch the output of the Op-amp inverter circuit for $V_{in} = 2\sin(2\pi \cdot 50 \cdot t)$ assuming power supply $\pm 12V$
- For a summing amplifier shown below, (a) Find voltage gain if $R_1 = R_2 = R_3 = 1K\Omega$ and $R_f = 5K\Omega$, (a) Estimate the output voltage if $V_1 = 1V$, $V_2 = V_3 = 2V$, $R_1 = R_2 = 10K\Omega$, $R_3 = 5K\Omega$ and $R_f = 15K\Omega$, assuming power supply $\pm 15V$



Unit-4: Active filters and instrumentation amplifiers

Five-mark Questions

REMEMBER

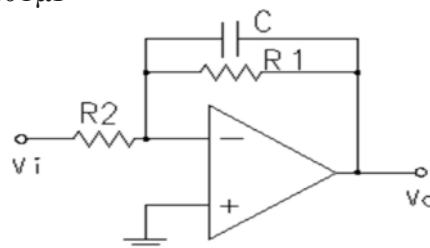
1. Define active filter and mention its classification
2. List the applications of active filters
3. Describe how BPF can be realised using LPF and HPF
4. Describe PLL
5. Define passive filter, active filter, cut-off frequency, band width and frequency response with reference to filters

UNDERSTAND

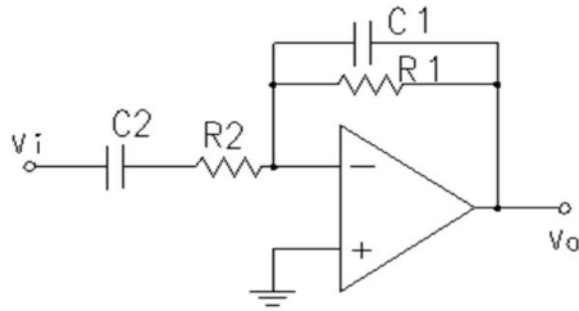
1. Illustrate how BEF can be realized using LPF and HPF
2. Distinguish between LPF and HPF
3. Compare BEF and BPF
4. Identify a circuit that can block low frequency signals and amplify high frequency signals and explain how it does.
5. Explain the need for instrumentation amplifier

APPLICATION

1. Construct first order HPF filter with a cut-off frequency of 1KHz and sketch its frequency response
2. Calculate the cut-off frequency and gain of the following filter circuit given that $R_1=10K\Omega$, $R_2=2K\Omega$ and $C=0.01\mu F$



3. Estimate the gain and cut-off frequencies of the following BPF given that $C_1= 0.01\mu F$, $C_2 = 1 \mu F$, $R_1=1K$ and $R_2 \approx 100 \Omega$



Ten-mark Questions

REMEMBER

- (a) Define active filter and list different filters based on frequency of filtering
(b) Describe the function of BEF with block diagram and frequency response plot
- (a) Describe the operation of PLL
(b) List the applications of PLL and instrument amplifier

UNDERSTAND

- (a) Explain the working of instrumentation amplifier circuit
(b) Describe the working of BPF
- (a) Explain the operation of PLL and mention its applications
(b) List the applications of the active filters
- (a) Explain the working principle and frequency response of 1st order Butterworth LPF

APPLICATION

- (a) Design a first order Butterworth LPF circuit for a gain of 10, cut-off frequency of 160Hz
(b) Sketch the frequency response plot and circuit of a typical HPF
- (a) Modify BPF filter to act as BEF at block diagram level and justify it
(b) List the advantages and disadvantages of active filters over passive filters

Unit-5: Wave-shaping circuits

Five-mark Questions

REMEMBER

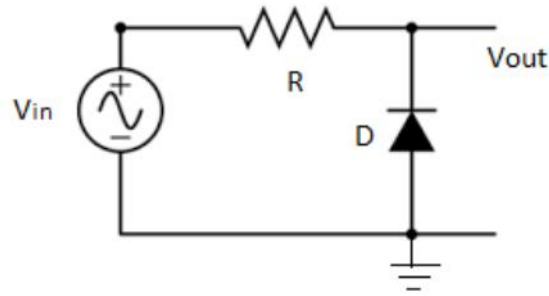
- List the applications of clippers and clampers
- Select and write the circuit diagram to generate triggering pulses from square wave
- Define positive clipper and briefly describe its working with a circuit diagram.
- Describe how square wave can be converted into triangular wave with the relevant wave shaping circuit
- Describe how DC level of AC waveform can be increased with a suitable circuit

UNDERSTAND

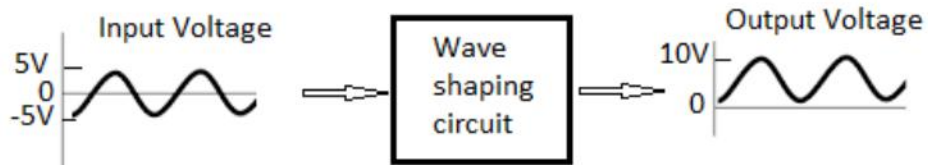
- Explain positive shunt clipper circuit using diode
- Sketch and label the combinational clipping circuit
- Write RC integrator circuit and plot its response for sinusoidal input
- Compare clipper with clamping circuit
- Distinguish between RC integrator with RC differentiator circuit

APPLICATION

- Write the output waveform of clipper circuit shown below for $V_{in} = 10 \sin(314t)$ assuming ideal diode



- Determine and sketch the wave shaping circuit shown in the following block diagram



- Show how half-wave rectifier can be realised using clipper circuit.

Ten-mark Questions

REMEMBER

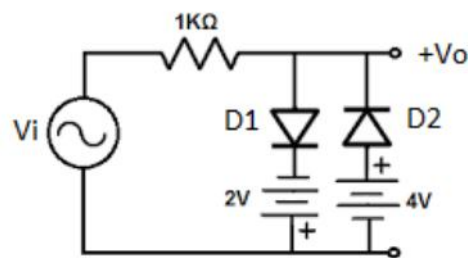
- Define Clipper. Explain simple positive and negative clipper circuits
- Define clamper. Explain simple positive and negative clamper circuits
- (a) List the applications of clippers and clampers
(b) Describe the working of RC integrator circuit

UNDERSTAND

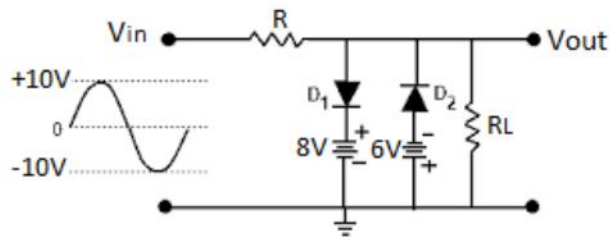
- Explain positive and negative shunt clipper circuits using diode
- (a) Differentiate clamper with clipper circuits
(b) Compare integrator with differentiator circuits
- Demonstrate (a) Differentiator circuit as triggering pulse generator (b) Integrator as triangular waveform generator

APPLICATION

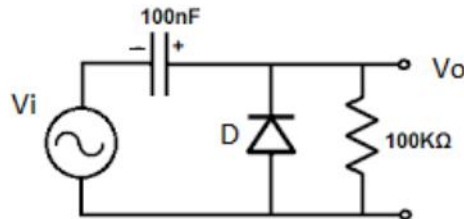
- Illustrate the operation of RC Differentiator and Integrator circuits with their response to square-wave signal.
- Construct a clipper circuit to generate a signal having maximum positive amplitude of 2V and negative amplitude of -10V for a sinusoidal input of +10 to -10 V.
- Write the output waveform of clipper circuit shown below for $V_i = 10 \sin(314t)$



- Write the output waveform for the clipper circuit shown below assuming ideal diodes



5. Sketch the output waveforms for the circuit shown below for $V_i = 10 \sin(314t)$ assuming
 (a) Si diode (cut-in voltage 0.7V) and (b) Germanium diode (cut-in voltage 0.3V)



Unit-6: Sinusoidal oscillators

Five-mark Questions

REMEMBER

1. Define stability, open-loop gain, closed loop-gain, loop phase-shift and feedback as applicable to oscillators.
2. Draw Hartley oscillator circuit that generates 500KHz sine wave.
3. Compare RC oscillators with LC oscillators

UNDERSTAND

1. Discuss the role of tank circuit in oscillator circuit
2. Relate Barkhausen criteria and sustained oscillations
3. Explain the role of RC network in RC phase-shift oscillator and write the expression for frequency of oscillation
4. Identify the oscillator to generate audio frequency oscillations and briefly describe it with circuit.
5. Sketch Wein-bridge oscillator circuit and state the role of bridge

APPLICATION

1. Design LC circuit for Hartley and Collpits oscillators to oscillate at 600KHz
2. Sketch RC phase-shift oscillator circuit to oscillate at 10KHz
3. Explain the relation between sustained oscillations and Barkhausen criteria as applicable to oscillator circuit.
4. Calculate the frequency of oscillations in Hartley oscillator given that $L_1 = 0.03\text{mH}$, $L_2 = 10\mu\text{H}$ and $C = 1\mu$. Suggest C_1 value to generate same frequency using Collpits oscillator assuming $C_2 = C$ and $L = L_2$

Ten-mark Questions

REMEMBER

1. (a) Draw RC phase-shift oscillator circuit with labelling
 (b) Define loop gain and feedback. Explain the Barkhausen criterion
2. (a) Draw the crystal oscillator circuit with labelling (4)
 (b) Define sustained, over-damped and under damped oscillations as applicable to oscillators (6)

3. (a) List the expressions for oscillating frequencies in Hartley, Collpits, RC phase-shift and Wein-bridge oscillators (8)
(b) State Barkhausen criterion (2)

UNDERSTAND

1. (a) Explain the concept of positive feedback, open and closed-loop gains (6)
(b) Select Collpits oscillator tank circuit to oscillate at 500 KHz (4)
2. (a) Explain the working of Hartley oscillator using BJT
(b) Compare LC oscillators with RC oscillators
3. Compare the crystal oscillator with RC phase-shift and Hartley oscillator

APPLICATION

1. Explain the working of Collpits oscillator using BJT. Illustrate how it can be converted to Hartley oscillator
2. (a) Calculate the operating frequency of a Collpits oscillator circuit, if $C_1 = 0.027 \mu\text{F}$, $C_2 = 0.027 \mu\text{F}$, and $L_1 = 220 \text{ mH}$
(b) Illustrate how Collpits oscillator can be converted into Hartley oscillator
3. (a) Construct RC phase-shift oscillator to oscillate at 12KHz
(b) Compare Wein-bridge and Hartley oscillators

End

Government of Karnataka
Department of Technical Education
Board of Technical Examinations, Bengaluru

Course Title : Digital Electronics	Course Code : 15EC32T
Semester : Third	Credits : 4
Teaching Scheme in Hrs (L:T:P) : 4:0:0	Course Group : Core
Type of course : Lecture	Total Contact Hours : 52
CIE : 25 Marks	SEE : 100 Marks

Prerequisites

Knowledge of basics of number systems and digital electronics.

Course Objectives

1. Understand the working of various digital electronics circuits.
2. Apply principles of number systems and Boolean algebra to solve simple logical problems
3. Learn to design the simple digital circuits.
4. Enable to learn principles digital processors in higher learning

Course Outcomes

On successful completion of the course, the students will be able to attain the following COs

Course Outcome		CL	Linked PO	Teaching Hrs
CO1	Apply the basic knowledge of digital electronics to construct and design simple combinational digital circuits.	<i>R/U/A</i>	1,2,3,4,10	09
CO2	Construct flip-flop circuits and analyze their functioning	<i>R/U/A</i>	1,2,3,4,10	09
CO3	Construct counters and shift registers and understand their operation.	<i>R/U/A</i>	1,2,3,4,10	10
CO4	Understand the functioning of A to D and D to A converters and their relevance.	<i>R/U/A</i>	1,2,3,4,10	09
CO5	Understand the function and applications of various types of memories and digital IC families.	<i>R/U/A</i>	1,2,3,4,10	09
CO6	Construct, analyze and verify the functioning of simple digital circuits/ICs using modern tools.	<i>R/U/A</i>	1,2,3,4,5,6,7,10	06
Total				52

Course-PO attainment matrix

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
Digital Electronics	3	3	3	3	1	1	1	--	--	3
<p><i>Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed.</i> Method is to relate the level of PO with the number of hours devoted to the COs which address the given PO. If $\geq 40\%$ of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3 If 25 to 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 2 If 5 to 25% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 1 If $< 5\%$ of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed.</p>										

Course content and pattern of marks for SEE

Unit	Unit Name	Teaching Hours	Questions for SEE			Marks	Weightage (%)
			R	U	A		
1	Combinational logic circuits	09	05	10	10	25	17
2	Basic sequential circuits	09	05	05	15	25	17
3	Registers and counters	10	05	10	15	30	20
4	D to A and A to D converters	09	05	10	10	25	17
5	Memories and programmable devices	09	05	10	10	25	17
6	Digital integrated circuits	06	05	05	05	15	12
Total		52	30	50	65	145	100

Legend: R- Remember, U- Understand, A- Application

Course Contents

Unit 1: Combinational logic circuits

09 Hours

Introduction: Combinational digital circuit. **Multiplexers:** definition, expression, truth-table, realization of simple (2:1) multiplexer using gates, and applications. Application of multiplexers to implement logic gates and simple sum-of-product equations, list of IC multiplexers and their features. Realization of higher-order multiplexer using lower-order multiplexer ICs. **Demultiplexer:** definition, expression, realization of simple (1:2) demultiplexer using gates, truth-table and applications, and list of IC demultiplexers and their features. **Decoders and encoders:** Definition and relevance of decoders and encoders. Logic diagram and truth-table of Decimal-to-BCD encoder and BCD-to-Decimal decoder. Identification of different decoder and encoder ICs. Need, logic diagram and truth table of BCD to 7-segment decoder. Concept and application of simple (maximum 4 bit) priority encoder.

Unit 2: Basic sequential circuits**09 Hours**

Introduction to sequential circuits: Comparison of combinational and sequential circuits. Definition of clock and triggering, types of triggering and their symbolic representations in logic circuits/diagrams. **Flip-flops:** Operation, gate-level circuit, symbol, truth-table and timing waveforms of clocked RS flip-flop and J-K flip-flop. Relevance of asynchronous inputs to flip-flops. Race-around problem and remedies, MS flip-flop, D and T flip-flop. Identify and list flip-flop ICs. **Timer 555:** Internal diagram of IC 555 and its application as astable and monostable multivibrators. Flip-flop as bistable multivibrator.

Unit 3: Registers and counters**10 Hours**

Registers: Classification of registers, realization of simple (3 or 4 bit) SISO, SIPO, PISO and PIPO using flip-flops, concept of universal shift-register. List shift-register ICs. **Ring counter and Johnson's counter:** 3 bit circuit, truth-table and on applications. **Counters:** definition, modulus, classification (definitions of up/down, asynchronous/synchronous, full-mod/partial-mod) and applications. Working and realization (using flip-flops) of asynchronous and synchronous 3-bit or 4-bit counters, and their comparison. Realization of higher-mod counters using lower-mod counters. List counter ICs and study configuring IC 7490 as decade counter.

Unit 4: D to A and A to D Converters**09 Hours**

Data/signal conversion: Concept and need. **DAC:** Definition, symbolic representation, types, and applications. Circuit, functioning and output expression for 3 or 4-bit DAC using Resistive divider and binary-ladder network. DAC specifications- resolution, accuracy, settling time, speed, linearity and monotonicity, and simple problems. Identify IC DACs and list their features. **ADC:** Definition, types, applications, specifications-resolution, accuracy, non-linearity, and conversion time. Working of 3-bit or 4-bit flash type, successive approximation and dual-slope ADCs, and simple problems. Identify IC ADCs and list their features.

Unit 5: Memories and programmable devices**09Hours**

Introduction: Definition and relevance of memories. **Classification:** Based on fabrication material, data retention, speed, storage capacity, cost and application. Working principle and features of magnetic memory, ROM, PROM, EPROM, E²PROM, flash memory, static and dynamic RAM cells, DDR memory & its variants and disk memories. Memory accessing process in semiconductor, magnetic and disk memories. Memory word-size and capacity of memories with examples. **Programmable devices:** Difference between fixed logic and programmable logic, PLA and PAL-architecture, and implementation of simple Boolean equations.

Unit 6: Digital integrated circuits**06 Hours**

Logic families: Introduction, classification, definitions of fan-in, fan-out, propagation delay, power dissipation and noise margin. Working and circuit of standard TTL NAND gate and CMOS inverter, voltage levels in TTL and CMOS. Comparison of characteristics ECL, TTL, I²L and CMOS logic families. Interfacing of TTL and CMOS devices. Features of HMOS and CHMOS families. Concept of ESD and remedy.

References

1. *Digital principles and applications*. Donald P Leach, Albert Paul Malvino, Goutam Saha, McGraw Hill Publisher, 8th edition, ISBN 10: [9339203402](#) ISBN 13: [9789339203405](#)
2. *Digital Systems-principles and applications*. Ronald J. Tocci, Neal S. Widmer, Gregory L. Moss, 10th edition, ISBN : 0131725793
3. *Digital Electronics –principles and integrated circuits*. Anil K. Maini. Wiley publications, first edition . ISBN: 978-0-470-03214-5
4. *Digital Computer Fundamentals,-* Thomas C Bartee ,McGraw-Hill Publisher,6th edition.ISBN 10: [0070038996](#) / ISBN 13: [9780070038998](#)
5. *Digital fundamentals –Floyd and Jain*, PEARSON EDUCATION publication, 8th Edition , ISBN-13: 978-0132359238 ,ISBN-10: 0132359235
6. www.nptel.ac.in
7. <http://freevideolectures.com/Course/3164/Digital-Electronics>
8. <http://www.freebyte.com/electronics/>
9. <https://www.circuitlogix.com>
10. <http://www.vlab.co.in>
11. www.electronics-tutorials.ws
12. <http://www.allaboutcircuits.com>
13. <http://ocw.mit.edu/>

Course Delivery

The course will be delivered through lectures, presentations and support of modern tools. Student activities are off-class

Course Assessment and Evaluation Scheme

Master Scheme

Assessment Method	What		To Whom	Assessment mode /Frequency /timing	Max. Marks	Evidence Collected	Course Outcomes
Direct assessment	CIE	IA	Students	Three tests ⁺	20	Blue Books	1 to 6
				Activity*	05	Activity Sheets	1 to 6
	SEE	End exam		End of the course	100	Answer Scripts at BTE	1 to 6
				Total	125		
Indirect assessment	Student feedback on course		Students	Middle of the Course	Nil	Feedback Forms	1 to 3 Delivery of course
	End of course survey			End of the Course	Nil	Questionnaires	1 to 6 Effectiveness of delivery instructions & assessment methods

Legends: CIE-Continuous Internal Evaluation, SEE- Semester End-exam Evaluation

⁺ Every I.A. test shall be conducted for 20 marks. Average of three tests, by rounding off any fractional part thereof to next higher integer, shall be considered for IA.

*Students should do activity as per the list of suggested activities/ similar activities with prior approval of the teacher. Activity process must initiated well in advance so that it can be completed well before the end of the term.

Questions for CIE and SEE will be designed to evaluate the various CLs as per the weightage shown in the following table.

Sl. No.	Cognitive Levels (CL)	Weightage (%)
1	Remembering	20
2	Understanding	35
3	Applying	45
Total		100

Continuous internal evaluation (CIE) pattern

(i) Student Activity (5 marks)

The following student activities or similar activities can be assigned for assessing CIE/IA marks

Sl. No.	Activity
1	Collect the information about the different types of display devices used in digital circuits and carry out a seminar
2	Collect the specification sheets, availability and cost of any two ADC and DAC ICs
3	Prepare a block diagram approach to construct a digital clock or a frequency counter or a digital voltmeter or any other similar digital electronic circuits and analyze the cost of the application
4	Prepare a note on E-waste and disposal of PCBs and ICs, carry out a seminar
5	Design and simulate the working of any simple logic circuit using a suitable modern software tool
Execution Notes: <ol style="list-style-type: none"> Maximum of 2 students in each batch for student activity Above activities may be distributed among different batches; activity No. 5 is mandatory and any one activity among 1 to 4 or any similar activities per batch may be assigned by the teacher based on interest of the students. Project activities shall be carried out throughout the semester and present the project report at the end of the semester; concerned teacher is expected to observe and record the progress of students' activities Submit qualitative hand-written report not exceeding 6 pages; one report per batch Each of the activity can be carried out off-class well in advance; however, demonstration/presentation should be done during laboratory sessions Assessment shall be based on quality of work as prescribed by the following rubrics table 	

(ii) Model of rubrics for assessing student activity (for every student)

Dimension	Scale					Marks (Example)
	1 Unsatisfactory	2 Developing	3 Satisfactory	4 Good	5 Exemplary	
1. Research and gathering information	Does not collect information relate to topic	Collects very limited information, some relate to topic	Collects basic information, most refer to the topic	Collects more information, most refer to the topic	Collects a great deals of information, all refer to the topic	3
2. Full-fills team roles and duties	Does not perform any duties assigned to the team role	Performs very little duties	Performs nearly all duties	Performs almost all duties	Performs all duties of assigned team roles	2
3. Shares work equality	Always relies on others to do the work	Rarely does the assigned work, often needs reminding	Usually does the assigned work, rarely needs reminding	Always does the assigned work, rarely needs reminding.	Always does the assigned work, without needing reminding	5
4. Listen to other team mates	Is always talking, never allows anyone to else to speak	Usually does most of the talking, rarely allows others to speak	Listens, but sometimes talk too much,	Listens and talks a little more than needed.	Listens and talks a fare amount	3
Total marks						ceil(13/4)= 4

(iii) CIE/IA Tests (20 Marks)

Three tests have to be conducted, during specified schedule, in accordance with the test pattern given below and their average-marks shall be considered for CIE/IA.

(iv) Format of CIE/IA test question paper

CIE Question Paper							
Institution Name and Code							
Course Coordinator/Teacher							
<i>Program Name</i>		<i>Test No.</i>		<i>Units</i>			
<i>Class/Sem</i>		<i>Date</i>		<i>CL</i>			
<i>Course Name</i>		<i>Time</i>		<i>COs</i>			
<i>Course Code</i>		<i>Max. Marks</i>		<i>POs</i>			
Note to students: Answer all questions							
Question No.	Question			Marks	CL	CO	PO
1							
2							
3							
4							

Legends: PO-Program Outcome, CO-Course outcome, CL-Cognitive Level, R-Remember, U-Understand, A-Apply

Note: Internal choice may be given in each CO at the same cognitive level (CL)

(v) Model question paper for CIE

CIE Question Paper					
Institution Name and Code					
Course Coordinator/Teacher					
Program Name	Electronics and Communication	Test No.	1	Units	1 & 2
Class/Sem	3 rd Sem	Date	--/------	CL	R/U/A
Course Name	Digital Electronics	Time	10-11AM	COs	1 & 2
Course Code	15EC32T	Max. Marks	20	POs	1& 3
Note to students: Answer all questions					
No.	Question	Marks	CL	CO	PO
1	Define a demultiplexer and construct a 1:4 demultiplexer using logic gates	05	R/A	1	1,2
2	Illustrate use of multiplexer to realize $y = \bar{A}\bar{B}\bar{C} + \bar{A}\bar{B}C + ABC$ OR Show how to realize 2-input NOR gate using a multiplexer IC	05	A	1	1,2
3	Define combinational and sequential circuits and compare them	05	R/U	2	1,2
4	Identify the problems associated with JK flip-flop and modify JK flip-flop or suggest remedy to overcome the problem OR Write the JK flip-flop gate-level diagram and convert it to D flip-flop	05	A/U	2	1,2

Semester End-exam Evaluation (SEE)

(i) End-exam question-paper pattern

Unit	Unit Name	Study Duration (Hrs.)	No. Questions for end-exam	
			PART – A 5 Marks	PART – B 10 Marks
1	Combinational logic circuits	09	01	02
2	Flip-flops and related circuits	09	01	02
3	Registers and counters	10	02	02
4	D to A and A to D converters	09	01	02
5	Memory devices	09	03	01
6	Digital integrated circuits	06	01	01
	Total	52	09 (45 Marks)	10 (100 Marks)

(ii) Model question paper

Course Title : **DIGITAL ELECTRONICS**

Course Code : **15EC32T**

Semester : **Third**

Time : **3 Hrs**

Max. Marks: **100**

Instructions: 1. Answer any **SIX** question from **Part A** (5x6=30 Marks)

2. Answer any **SEVEN** full questions from **Part B** (7x10=70 Marks)

Part A

1. Define combinational and sequential digital circuits with examples.
2. Describe the functioning of RS flip-flop with gate-level circuit and truth table.
3. Define shift register and list different types of data movements in it.
4. Sketch the timing diagram for serial shifting of 101 data in 3-bit shift register.
5. Define resolution, accuracy, settling time, monotonicity, and speed as related to DAC.
6. List the features of magnetic memories.
7. Explain the working principle of Dynamic RAM cell.
8. Compare PLA and PAL.
9. Describe briefly the operation of TTL NAND gate with circuit.

Part B

1. (a) Construct 4:1 multiplexer using 2:1 multiplexers.
(b) Illustrate use of multiplexer in implementation of simple Boolean functions with example.
2. a) Explain the role of BCD to 7-segment decoder in numbers display.
b) Discuss the role of control signals in demultiplexer circuit.
3. a) Explain the function of D flip-flop and also write truth-table.
b) Calculate the frequency at Q of JK flip-flop if it is triggered by 1 KHz clock signal under toggle mode, and sketch the input and output signals.
4. Show how to configure 555 timer as monostable multivibrator and astable multivibrator.
5. Construct a mod-7 counter and explain its functioning with the help of truth table and timing waveforms.
6. Show how to configure 7490 IC as decade counter and write its truth table.

7. Explain a binary ladder network of DAC with expression output. List its advantages.
8. (a) Calculate the resolution of a 4-bit DAC in terms of percentage of full-scale voltage
(b) For a 5-bit resistive divider, determine the following i) the weight assigned to the LSB.
ii) The change in the output voltage due to a change in the LSB. iii) The output voltage for a digital input of 10110. Assume $0 = 0\text{ V}$ and $1 = +10\text{ V}$.
9. a) Calculate the number of address lines required to access 512 Kilo bytes of memory and calculate how many bytes of memory can be accessed with 15 address lines assuming byte addressable memory.
b) Identify the functional pins required for a typical RAM IC.
10. a) Explain the functioning of CMOS inverter.
b) List the voltage levels of TTL family.

Institutional activities (No marks)

The following are suggested institutional activities, to be carried out at least one during the semester. The course teacher/coordinator is expected to maintain the relevant record (Containing, Activity name, Resource persons and their details, duration, venue, student feedback, etc) pertaining to Institutional activities.

Sl. No.	Activity
1	Organize Seminar, workshop or Lecture from experts on the modern trends/developments in digital electronics.
2	Organize hands-on practice on design and simulation of digital circuits.
3	Motivate students to take case study on different digital electronics-based mini projects to inculcate self and continuous learning.

Model Question Bank

Note: The questions in the question bank are indicative but not exhaustive. Sub-questions on different CLs may be combined to frame 10-marks questions or 10-marks questions given here can be splitted into 5-marks questions if necessary keeping weightage of CLs approximately intact and adhering to SEE end-exam pattern.

Unit-1: Combinational logic circuits

Five-mark Questions

REMEMBER

1. Define combinational and sequential digital circuits with examples.
2. List any five combinational circuits and state their functions.
3. List any five sequential circuits and state their functions.
4. Define i) encoder, ii) decoder, iii) multiplexer, iv) demultiplexer, and v) priority encoder
5. Describe the demultiplexing function with the help of any demux circuit/IC
6. Describe the working of 4:1 multiplexer with the help of suitable diagram

7. Describe the multiplexing process with suitable digital multiplexer circuit.
8. Describe the working of simple priority encoder
9. Name the pin functions in any typical demultiplexer IC
10. List the truth-table entries of BCD to 7-segment decoder
11. List the similarities and dissimilarities between encoders and multiplexers
12. Name the applications of multiplexer, demultiplexer, encoder, decoder and priority encoder

UNDERSTAND

1. Explain the working of any decoder with logic circuit
2. Explain the working of encoder with logic circuit
3. Explain how to implement the Boolean function $y = A\bar{B} + \bar{A}B$ using a multiplexer IC
4. Compare encoder and decoder
5. Differentiate between multiplexer and demultiplexer
6. Demonstrate how BCD are displayed using combinational circuit
7. Differentiate between encoder and priority encoder

APPLICATION

1. Show how a 4-to-1 multiplexer can be realized using 2-to-1 multiplexers.
2. Show how to implement NAND function using a multiplexer IC
3. Construct 1:2 demultiplexer using gates and demonstrate its function
4. Write the truth table of 3 bit priority encoder
5. Calculate the control lines needed for 4:1 mux and 1:8 demux sketch the their logic diagrams

Ten-mark Questions

UNDERSTAND

1. Classify the combinational circuits and state the function and application of each category.
2. (a) Explain the role of BCD to 7 –segment decoder in numbers display
(b) Compare combinational and sequential digital circuits with examples
3. (a) Convert multiplexer to logic gate
(b) Discuss the role of control signals in demultiplexer circuit.

APPLICATION

1. (a) Construct 4:1 multiplexer using 2:1 multiplexers.
(b) Illustrate use of multiplexer in implementation of simple Boolean functions
2. (a) Demonstrate the use of BCD to 7-segment decoder in numbers display
(b) Write simple encoder circuit and its truth-table
3. (a) List any five applications of combinational circuits
(b) List any five pin functions of multiplexer IC
4. (a) Write simple decoder circuit and its truth table
(b) List the similarities between demultiplexer and demultiplexer

Unit-2: Flip-flops and related circuits

Five-mark Questions

REMEMBER

1. Define flip-flop and list its applications
2. Describe different types of triggering flip-flops
3. Describe the functioning of RS flip-flop with gate-level circuit and truth table
4. List various flip-flops with logic diagrams.

- Name the pins and their functions in a typical JK flip-flop.
- Describe the functioning of D flip-flop with truth table
- Locate the toggle state in the truth table of JK flip-flop and state its meaning and relevance
- Describe how flip-flop can be used as divide-by-two counter with relevant waveforms
- List the pin functions of 555 timer and name any two applications

UNDERSTAND

- Differentiate between combinational and sequential circuits.
- Explain the truth table of a D flip-flop and sketch the timing waveforms.
- Distinguish between Preset and Clear inputs and briefly explain their significance
- Illustrate race-around problem and discuss how it can be eliminated in JK flip-flops
- Explain different types of triggering of sequential circuits
- Modify JK flip-flop into D flip-flop
- Convert JK into T flip-flop
- List the ICs of RS, JK, JK-MS, D flip-flops and timer

APPLICATION

- Calculate the frequency at Q of JK flip-flop if it is triggered by 1KHz clock signal under toggle mode, and sketch the input and output signals.
- Show how 555 timer can be configured to generate 1KHz clock signal
- Calculate the pulse width of unstable state of 555-monostable multivibrator for a 4.7K Ω resistor and a 1.5 μ F capacitor.
- Show how to configure JK flip-flop as D flip-flop with truth table
- Demonstrate how flip-flop can be used as memory cell

Ten-mark Questions

UNDERSTAND

- (a) Explain the working of D-flip-flop with relevant diagram and waveform
(b) Demonstrate conversion of JK flip-flop into T flip-flop
- (a) Compare sequential circuits with combinational circuits
(b) Compare T flip-flop with D flip-flop
- (a) Explain the concept of racing condition and suggest methods to overcome this.
(b) Show how two JK flip-flops can be cascaded to act as divided-by-4 counter.
- Explain the working of clocked RS flip-flop with the help of gate-level diagram, truth-table and timing and output wave forms.
- (a) Compare 555 timer as astable multivibrator and monostable multivibrator
(b) Demonstrate how flip-flop can be used as single-bit memory cell.
- Explain the internal diagram of IC555 timer and name its applications

APPLICATION

- (a) Illustrate how JK flip-flop can be used as 1-bit memory element.
(b) Write gate-level circuit of clocked RS flip-flop and its truth table
- (a) Calculate the frequency of the output at Q of a JK flip-flop when it is triggered by 100Hz signal under toggle state and justify your answer
(b) List the features of 555 timer IC
- Show how to configure 555 timer as monostable multivibrator and astable multivibrator

Unit 3: Registers and counters

Five-mark Questions

REMEMBER

1. Describe construction and working of 3-bit shift register
2. Define shift register and list different types of data movements in it
3. Describe the concept of universal shift register and list its applications
4. Define counter, modulus, register, up counting and down counting
5. List the pin functions of a typical IC counter
6. Name the applications of sequential circuits
7. Describe the functioning of mod -8 asynchronous counter with diagram

UNDERSTAND

1. Show how shift register can be realized using flip-flops
2. Explain shifting data bit-by-bit in a 3-bit shift register with relevant diagram
3. Sketch the timing diagram for serial shifting of 101 data in 3-bit shift register
4. Explain the working of 3-bit ring counter with truth-table and logic circuit
5. Compare Ring counter with Johnson counter
6. Differentiate between counter and shift register
7. Identify the applications of shift registers and counters
8. Relate number of flip-flops and modulus of a counter

APPLICATION

1. Write the truth table of 3-bit counter
2. Illustrate 3 bits can be stored in a 3-bit shift register
3. Construct 3-bit shift register to that can allow parallel movement of data
4. List pin functions of a typical shift register IC
5. Sketch the timing diagram/waveforms of a mod-6 counter
6. Sketch the timing diagram/waveforms of 3-bit ring counter
7. Compute the overall modulus of cascaded counter containing mod 2, mod5 and mod3, and justify your answer.

Ten-mark Questions

UNDERSTAND

1. (a) Compare Johnson counter and ring counter.
(b) Distinguish between synchronous counter and asynchronous counters.
2. (a) Compare SISO and PIPO operation of shift register with examples
(b) Distinguish between SIPO and PISO operation with examples.
3. Explain the functioning of a 3-bit shift register under SIPO and SISO modes.
4. Describe the operation of mod 8 counter with the help of circuit and truth table

APPLICATION

1. Construct a mod-7 counter and explain its functioning with the help of truth table and timing waveforms
2. (a) Show how flip-flops can be used to realise counter
(b) List different ways of data movement in shift registers
3. Show how to configure 7490 IC as decade counter and write its truth table
4. (a) Writ the truth table and circuit of mod 5 counter
(b) Sketch the timing waveforms of a mod 5 counter
5. a) List the applications of counters and shift registers
(b) Construct a 3-bit counter that circulates the data.

Unit-4: Digital to Analog and Analog to Digital converters

Five-mark Questions

REMEMBER

1. Define resolution, accuracy, settling time, monotonicity, and speed as related to DAC
2. Describe the functioning of a 4 bit ladder-type DAC
3. List the pin functions of a typical DAC IC
4. Describe briefly the operation of a 4-bit SAR DAC
5. List the specifications of ADC and define them
6. List the features of flash-type ADC

UNDERSTAND

1. Distinguish between DAC and ADC
2. Explain the need for ADC and DACs in computing
3. Identify the pins of a typical ADC IC and state their functions
4. Identify the different parts of SAR ADC and state their functions
5. Classify DAC circuits and compare them
6. Compare the features of SAR ADC with Dual slope ADC

APPLICATION

1. An 8-bit DAC produces an analog output of 12.5 mV for a digital input 0000010. Determine the analog output for a digital input of 00001011
2. Determine the resolution of a 12-bit A/D convertor having a full-scale analog input voltage of 5V.
3. An 8-bit D/A convertor has a step size of 20mv. Determine the full-scale output and percentage resolution

Ten-mark Questions

UNDERSTAND

1. Explain a binary ladder network of DAC with suitable diagram and expressions. List its advantages.
2. Explain the working of a 3-bit flash type ADC. List its advantages.
3. Explain the working of a successive approximation type ADC and compare its features with flash type ADC.
4. Explain the working of a dual-slope type ADC and summarize its advantages.

APPLICATION

1. Show how dual-slope ADC can be used to convert analog signal into digital form with circuit and relevant waveforms.
2. (a) Calculate the resolution of a 4 bit DAC in terms of percentage of full-scale voltage
(b) For a 5-bit resistive divider, determine the following i) The weight assigned to the LSB.
ii) The change in the output voltage due to a change in the LSB. iii) The output voltage for a digital input of 10110. Assume logical 0= 0 V and 1= + 10 V.

Unit 5: Memories and programmable devices

Five-mark Questions

REMEMBER

1. Describe the role of memories in computers
2. List the memory types based on fabrication material and data retention
3. List the features of DDR memory
4. List the features of flash memory
5. List the features of magnetic memories
6. List the features of PLA

UNDERSTAND

1. Classify the memories based on speed and fabrication material
2. Distinguish between (i) ROM and RAM memories and (ii) Flash and Magnetic memories
3. Compare the features of static and dynamic RAM
4. Explain the working principle of Dynamic RAM cell
5. Relate the memory capacity and address range with examples
6. Compare PLA and PAL

APPLICATION

1. Calculate the address lines required to access 512 Kilo bytes of memory and calculate how many bytes of memory can be accessed with 15 address lines assuming byte addressable memory
2. Identify the functional pins required for RAM IC
3. Show how PAL can be used to implement simple Boolean expressions

Ten-mark Questions

UNDERSTAND

1. (a) Compare volatile and non-volatile memories
(b) Compare PLA and PAL
2. (a) Explain the working principle of static RAM cell
(b) Compare the features of DDR1 and DDR2 memories

APPLICATION

1. Show how the PAL-type array should be programmed in order to implement each of the following SOP expressions. Use a mark **X** to indicate an intact fuse. Simplify the expressions, if necessary. a) $Y = \overline{A}BC + \overline{A}B\overline{C} + ABC$ b) $Y = \overline{A}BC + \overline{A}B\overline{C} + A\overline{B}C + \overline{A}BC$
2. A certain memory is specified as 32k x8. Determine a) the number of bits in each word b) the number of words being stored c) the number of memory cells d) the number of address input lines, e) the number of data input lines and f) the number of data output lines.
3. The 2125A is a static RAM IC that has a capacity of 1Kx1, one active-LOW chip select input, and separate data input and output. Show how to combine several 2125A ICs to form a 1Kx8 module.
4. Two 16 MB RAMS are used to build a RAM capacity of 32 MB. Show the configuration and also state the address inputs for which the two RAMs will be active. The two RAMs have common I/O pins, a write enable input that is active-LOW, and a chip select input that is active -HIGH.
5. (a) List the features and applications of E²PROM.
(b) List types and features of disk memories.
6. (a) Explain accessing process in (i) Magnetic memories and (ii) RAM

- (b) List the features of DDR memory

Unit 6: Digital integrated circuits

Five-mark Questions

REMEMBER

1. Define fan-in, fan-out, propagation delay, power dissipation and noise margin as applicable to logic families
2. Describe briefly the operation of TTL NAND gate with circuit
3. List the features of ECL family
4. List the features of CMOS family

UNDERSTAND

1. Compare CMOS family with TTL family
2. Distinguish between HMOS and CHMOS
3. Explain the functioning of CMOS inverter
4. Classify the Integrated circuits based on the scale of integration.

APPLICATION

1. List the advantages and disadvantages of CMOS
2. List the voltage levels of TTL family

Ten-mark Questions

APPLICATION

1. a) Show how a CMOS buffer can drive a TTL load.
b) List the advantages of CMOS devices.
2. a) Illustrate interfacing of TTL gate/circuit to CMOS gate/circuit.
b) Explain the interfacing of CMOS devices to TTL devices.

End

Government of Karnataka
Department of Technical Education
Board of Technical Examinations, Bengaluru

Course Title : ANALOG COMMUNICATION	Course Code : 15EC33T
Semester : Third	Credits : 4
Teaching Scheme in Hrs (L:T:P) : 4:0:0	Course Group : Core
Type of course : Lecture	Total Contact Hours : 52
CIE : 25 Marks	SEE : 100 Marks

Prerequisites

Basic knowledge of semiconductor devices and basic principles of electrical and electronics

Course Objectives

1. Apply the basic knowledge of BEEE theory and analyze the network theorems
2. Understand the functioning and application of resonance, filters and attenuator circuits
3. Describe the working of analog modulation and demodulation circuits
4. Understand transmission lines and matching networks

Course Outcomes

On successful completion of the course, the students will be able to attain the following COs:

Course Outcome		CL	Linked POs	Teaching Hrs
CO1	Analyze and apply the network theorems.	R/U/A	1,2,3,10	10
CO2	Design the simple filters and attenuator circuits.	R/U/A	1,2,3,10	11
CO3	Describe the operation of transmission lines and matching networks	R/U/A	1,2,3,10	07
CO4	Describe and distinguish of analog modulation techniques.	R/U/A	1,2,3,10	07
CO5	Differentiate types of antennas and wave propagation.	R/U/A	1,2,3,10	09
CO6	Decide the appropriate modulation and demodulation technique for suitable transmitter and receiver circuit.	R/U/A	1,2,3,10	08
Total				52

Legends: PO-Program Outcome, CO-Course Outcome, CL-Cognitive Level, R-Remember, U-Understand, A-Apply

Course-PO attainment matrix

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
Analog Communication	3	3	3	--	--	--	--	--	--	3
<p style="text-align: center;">Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed.</p> <p>Method is to relate the level of PO with the number of hours devoted to the COs which address the given PO.</p> <p>If $\geq 40\%$ of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3</p> <p>If 25 to 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 2</p> <p>If 5 to 25% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 1</p> <p>If $< 5\%$ of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed.</p>										

Course content and pattern of marks for SEE

Unit	Unit Name	Teaching Hours	Questions for SEE			Marks	Weightage (%)
			R	U	A		
1	Network Theorems	10	05	10	15	30	20
2	Resonance, Filters and attenuators	11	05	10	15	30	20
3	Transmission Lines	07	05	05	10	20	12
4	Antennas and Wave Propagation	07	05	05	10	20	12
5	Amplitude Modulation and demodulation	9	05	10	10	25	15
6	Frequency Modulation and demodulation	08	05	05	10	20	15
Total		52	30	45	70	145	100

Legend: R- Remember, U-Understand A-Application

Course Contents

Unit 1: Network Theorems

10 Hours

Network Theorems: Superposition theorem, Thevenin's theorem, Maximum Power Transfer theorem and Norton's theorem, Statements and simple problems.

Unit 2: Resonance, filters and attenuators

11 Hours

Resonance: Definition, types, applications of resonance. **Series resonance and Parallel resonance:** circuit diagram, phasor diagram, resonance plot and characteristics. Condition for resonance. Derivation for frequency of resonance. Expressions for impedance, current, voltage, Q factor, power factor and bandwidth in terms of Q. Simple problems. **Passive Filters:** Definition of Filter, cut-off frequency, pass band and stop band. Classification of filters. Ideal characteristics curve of passive LPF, HPF, BPF and BRN. Circuit diagram of T and PI configurations of LPF and HPF (**Only expressions, No Derivation**), Simple problems. Block diagrams to realize BPF & BRN using LPF & HPF.

Attenuators: Definition, classification and applications of attenuators. Definition of Bel, Decibel and Neper. Relationship between Bel, Decibel and Neper. Express attenuation in dB. Circuit diagram of symmetrical T and II type attenuators (**Only expressions, No Derivation**).

Unit 3: Transmission lines

07 Hours

Transmission Lines: Definition of transmission line, different types of transmission lines (power lines, Parallel wire, coaxial, Wave guide). Mention their applications. Electrical model of a transmission line, Definition of primary constants: R, L, G and C. Definition of secondary constants: Characteristic impedance and Propagation Constant, expressions for secondary constants in terms of primary constants. Concept of reflection and standing waves, expressions for standing wave ratio, reflection coefficient, standing wave ratio in terms of

reflection coefficient and reflection coefficient in terms of standing wave ratio. Wave patterns for Voltage & Current on Short circuited line and Open circuited line. Impedance matching techniques: Single stub matching and double stub matching

Unit 4: Antennas and wave propagation

07 Hours

Antennas: Definition of antenna and dipole. Concept of electric and magnetic fields in a dipole. Definition of Polarization, Isotropic radiator, Radiation pattern, Directive gain, Directivity, Power gain, Antenna resistance, Antenna efficiency, Beam width. **Array antenna:** Definition and types of array antenna, working of broadside, end-fire array, mention their applications. Features of yagi-uda antenna. Working of Parabolic reflector (Dish Antenna) – Feed mechanisms – Cassegrain and Horn feed. **Wave Propagation:** Fundamentals of Electromagnetic Waves, electromagnetic spectrum, modes of wave propagation: ground wave propagation, sky wave propagation and space wave propagation. Comparison of modes of wave propagation.

Unit 5: Amplitude modulation and demodulation

09 Hours

Modulation: Block diagram of electronic communication system, distinguish between analog and digital communication, define modulation, need for modulation and types of analog modulation techniques. **Amplitude modulation and demodulation:** definition, block diagram and waveform, expressions of modulating signal, Carrier signal, modulated signal, modulation index in terms of modulating voltage (V_m) and carrier voltage (V_c), modulation index in terms of maximum voltage (V_{max}) and minimum voltage (V_{min}), modulation index in case of simultaneous modulations, LSB and USB, Bandwidth, Power in AM wave. Solve simple problems. Amplitude Modulator circuit using diode. Demodulation of AM wave, working of AM Linear diode detector circuit. Definition with working principal of SSBSC, DSBSC, VSB and comparison between them.

Unit 6: Frequency modulation and demodulation

08 Hours

Frequency Modulation and demodulation: definition, block diagram and waveform, expressions of frequency deviation, modulation index. Relationship between frequency deviation and modulation index. Carson's rule for bandwidth. Varactor diode method of generating FM. **FM detectors:** Foster Seeley discriminator and Ratio detector. Need for pre-emphasis and de-emphasis circuits. Merits and demerits of FM over AM, Definition of Phase modulation. Definition of Selectivity, Sensitivity, Gain, Fidelity, Image Frequency and its Rejection, Double Spotting, Noise Figure.

References

1. *Electrical Engineering Fundamentals*, by Vincent Del Toro, Prentice-hall of India Pvt. Ltd. ISBN: 0132471310, 9780132471312
2. *Communication Engineering*, by Vijayachitra, McGraw Hill Education (India) Private Limited; First edition (1 May 2013), ISBN: 1259006867, 9781259006869
3. *Basic Electrical Engineering*, by D.P. Kothari and I.J. Nagrath, Tata McGraw-Hill Publishing Pvt. Ltd. ISBN: 0070435898, 9780070435896
4. *Electronic Communication systems* by William Schweber, Fourth Edition PHI Publications ISBN: 0130916218, 9780130916211
5. *Electronic Communication* by Dennis Roddy and John Coolen PHI Publications ISBN: 8177585584, 9788177585582

6. *Analog and Digital Communications* – T L Singal, McGraw Hill Education
7. ISBN: 1259084523, 9781259084522
8. <http://nptel.ac.in/courses/117102059/>
9. https://www.youtube.com/watch?v=Xw2_AWWjAn0
10. https://www.youtube.com/watch?v=UW_X2sfwA5w
11. <https://www.youtube.com/watch?v=dGu2mxpTRPs>
12. <https://www.youtube.com/watch?v=hqhV50852jA>
13. https://www.youtube.com/watch?v=ZYgFuUI9_Vs
14. https://www.youtube.com/watch?v=m9ikRi_-lqo
15. https://www.youtube.com/watch?v=eNmh_G_v_-o
16. <https://www.youtube.com/watch?v=wegmG4qHvkk>
17. https://www.youtube.com/watch?v=_5JyiFWLn-w
18. <https://www.youtube.com/watch?v=SmW4z76KgNQ&spfreload=10>
19. <https://www.youtube.com/watch?v=R04yEKqgGPc>

Course Delivery

The course will be delivered through lectures, presentations and support of modern tools. Student activities are off-class.

Course Assessment and Evaluation Scheme

Master Scheme

Assessment Method	What		To Whom	Assessment mode /Frequency /timing	Max. Marks	Evidence Collected	Course Outcomes
Direct assessment	CIE	IA	Students	Three tests ⁺	20	Blue Books	1 to 6
				Activity*	05	Activity Sheets	1 to 6
	SEE	End exam		End of the course	100	Answer Scripts at BTE	1 to 6
				Total	125		
Indirect assessment	Student feedback on course		Students	Middle of the Course	Nil	Feedback Forms	1 to 3 Delivery of course
	End of course survey			End of the Course	Nil	Questionnaires	1 to 6, Effectiveness of delivery instructions & assessment methods

Legends: CIE-Continuous Internal Evaluation, SEE- Semester End-exam Evaluation

⁺ Every I.A. test shall be conducted for 20 marks. Average of three tests, by rounding off any fractional part thereof to next higher integer, shall be considered for IA.

*Students should do activity as per the list of suggested activities/ similar activities with prior approval of the teacher. Activity process must initiated well in advance so that it can be completed well before the end of the term.

Questions for CIE and SEE will be designed to evaluate the various CLs as per the weightage shown in the following table.

Sl. No.	Cognitive Levels (CL)	Weightage (%)
1	Remembering	20
2	Understanding	30
3	Applying	50
Total		100

Continuous internal evaluation (CIE) pattern

(i) Student Activity (5 marks)

The following student activities or similar activities can be assigned for assessing CIE/IA marks

Sl. No.	Activity
1	Visit any local small-scale industry and prepare work flow of any specific electronic module preparation- from discrete components to module fabrication.
2	Design, construct and demonstrate any resonant circuit
3	Prepare a document on different antennas and tabulate the specific details of each / datasheets/ application
4	Demonstrate Amplitude modulation and demodulation
5	Demonstrate / presentation / simulation how Radio works
6	Demonstrate / presentation / simulation how LED TV works
7	Prepare/collect animation video of wave propagation and fundamentals of Electromagnetic Waves and give presentation on it.
8	List different wave propagations and give presentation on it.
<p>Execution Note:</p> <ol style="list-style-type: none"> Maximum of 2 students in each batch for student activity Any two activities (either from the list given or any similar activities) shall be assigned among different batches; may be assigned by the teacher based on interest of the students. Project activities shall be carried out throughout the semester and present the project report at the end of the semester; concerned teacher is expected to observe and record the progress of students' activities Submit qualitative hand-written report not exceeding 6 pages; one report per batch Each of the activity can be carried out off-class well in advance; however, demonstration/presentation should be done during laboratory sessions Assessment shall be based on quality of work as prescribed by the following rubrics table 	

(ii) Model of rubrics for assessing student activity

Dimension	Scale					Marks (Example)
	1 Unsatisfactory	2 Developing	3 Satisfactory	4 Good	5 Exemplary	
1. Research and gathering information	Does not collect information relate to topic	Collects very limited information, some relate to topic	Collects basic information, most refer to the topic	Collects more information, most refer to the topic	Collects a great deals of information, all refer to the topic	3
2. Full-fills team roles and duties	Does not perform any duties assigned to the team role	Performs very little duties	Performs nearly all duties	Performs almost all duties	Performs all duties of assigned team roles	2
3. Shares work equality	Always relies on others to do the work	Rarely does the assigned work, often needs reminding	Usually does the assigned work, rarely needs reminding	Always does the assigned work, rarely needs reminding.	Always does the assigned work, without needing reminding	5
4. Listen to other team mates	Is always talking, never allows anyone to else to speak	Usually does most of the talking, rarely allows others to speak	Listens, but sometimes talk too much,	Listens and talks a little more than needed.	Listens and talks a fare amount	3
Total marks						ceil(13/4)= 4

(iii) CIE/IA Tests (20 Marks)

Three tests have to be conducted, during specified schedule, in accordance with the test pattern given below and their average-marks shall be considered for CIE/IA.

(iv) Format of CIE/IA test question paper

CIE Question Paper							
Institution Name and Code							
Course Co-ordinator/Teacher							
Program Name		Test No.		Units			
Class/Sem		Date		CL			
Course Name		Time		COs			
Course Code		Max. Marks		POs			
Note to students: Answer all questions							
Question No.	Question			Marks	CL	CO	PO
1							
2							
3							
4							

Legends: PO-Program Outcome, CO-Course outcome, CL-Cognitive Level, R-Remember, U-Understand, A-Apply
Note: Internal choice may be given in each CO at the same cognitive level (CL).

(v) Model question paper for CIE

CIE Question Paper					
Institution Name and Code					
Course Co-ordinator/Teacher					
<i>Program Name</i>	Electronics and Communication	<i>Test No.</i>	1	<i>Units</i>	1 & 2
<i>Class/Sem</i>	3 rd Sem	<i>Date</i>	1/1/2017	<i>CL</i>	R/U/A
<i>Course Name</i>	Analog Communication	<i>Time</i>	10-11AM	<i>COs</i>	1 & 2
<i>Course Code</i>	15EC33T	<i>Max. Marks</i>	20	<i>POs</i>	1, 2 & 3
Note to students: Answer all questions					
No.	Question	Marks	CL	CO	PO
1	State and explain Thevenin's theorem with an example Or State and prove Maximum Power transfer theorem with an example	5+5	U/A	1	1,2,3
2	Define resonance, mention types and its applications	05	R/A	2	1,2
3	Derive expression for frequency of resonance for series resonance circuit	05	A	2	1,2
4		05	A	2	1,2

Semester end-exam evaluation (SEE)**(i) End-exam question-paper pattern**

Unit	Unit Name	Study Duration (Hrs.)	No. Questions for end-exam		Marks
			PART – A 5 Marks	PART – B 10 Marks	
1	Network theorems	10	02	02	30
2	Resonance, filters and attenuators	11	02	02	30
3	Transmission lines	07	02	01	20
4	Antenna and wave propagation	07	02	01	20
5	Amplitude Modulation and demodulation	09	01	02	25
6	Frequency Modulation and demodulation	08	00	02	20
Total		52	09 (45 Marks)	10 (100 Marks)	145

Note: Sub-questions on different CLs may be combined to frame 10-marks questions or 10-marks questions given here can be splitted into 5-marks questions if necessary keeping weightage of CLs approximately intact and adhering to SEE end-exam pattern

(ii) Model question paper

Course Title : **ANALOG COMMUNICATION**

Course Code : **15EC33T**

Time : **3 Hrs**

Semester : **Third**

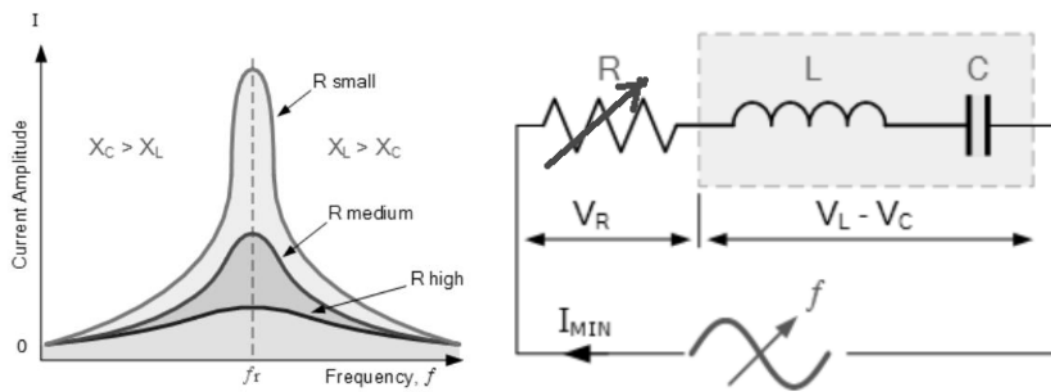
Max. Marks: **100**

Instructions: 1. Answer any **SIX** question from **Part A** (5x6=30 Marks)

2. Answer any **SEVEN** full questions from **Part B** (7x10=70 Marks)

Part-A

1. Employ the suitable circuit and describe it with respect to superposition theorem
2. State the relevance of Maximum Power Transfer theorem with suitable circuit diagram
3. Define resonance, mention types and its application
4. Whether the curve represents the response of the circuit given below. Justify why current is maximum at resonance.



5. Write a note on single-stub matching and double-stub matching.
6. Point out the working of parabolic reflector (Dish Antenna) – Feed mechanisms – Cassegrain and Horn feed.
7. Compare the modes of wave propagation.
8. Distinguish analog and digital modulation technique.
9. Write a short note on FM detectors.

Part-B

1. Problem on Thevenin's theorem
2. Illustrate the application of the Norton's theorem with an example.
3. Derive expression for frequency of resonance, Q factor, power factor and bandwidth
4. (a) Realize BPF & BRF using LPF & HPF
(b) Problem on attenuator
5. Discuss the concepts of reflection and standing waves, expressions for standing wave ratio
6. With relevant expression/figures define Polarization, Isotropic radiator, Radiation pattern, Directive gain, Directivity, Power gain, Antenna resistance, Antenna efficiency, Beam width.
7. (a) Derive modulation index in terms of V_{max} and V_{min}
(b) Compare SSBSC, DSBSC and VSB
8. Identify the modulation technique described by the following equation. Also sketch the waveform and block diagram that can generate the waveform.
 $S(t) = V_{m1}(t) \cos(\omega_c t) + V_{m2}(t) \cos(\omega_c t + 90^\circ)$

9. Define the phase modulation of Selectivity, Sensitivity, Gain, Fidelity , Image Frequency and its Rejection, Double Spotting, Noise Figure
10. (a) Write and explain Varactor diode method for generating FM
(b) Explain need for pre-emphasis and de-emphasis along with circuits.

Institutional activities (No marks)

The following are suggested institutional activities, to be carried out at least one during the semester. The course teacher/coordinator is expected to maintain the relevant record (Containing, Activity name, Resource persons and their details, duration, venue, student feedback, etc) pertaining to Institutional activities.

Sl. No.	Activity
1	Organize Seminar, workshop or Lecture from experts on the modern trends in communication
2	One day visit to nearby industry/ electronic equipment service centre/radio station/TV station/ Microwave tower
3	Motivation class for the students to take case study on different communication-based mini projects (small applications) to inculcate self and continuous learning.

End

Government of Karnataka
Department of Technical Education
Board of Technical Examinations, Bengaluru

Course Title: Electronic Measurements and Instrumentation	Course Code : 15EC34T
Semester : Third	Credits : 4
Teaching Scheme in Hrs (L:T:P) : 4:0:0	Course Group : Core
Type of course : Lecture + Quiz	Total Contact Hours : 52
CIE : 25 Marks	SEE : 100 Marks

Prerequisites

Basics of electrical and electronics engineering.

Course Objectives

1. Familiarisation of the basic terms, errors and standards in electronic measurements.
2. Discussion of the working principles, uses of different types of instruments in testing procedures.
3. To understand the working principles of commonly used sensors ,signal conditioners and display systems used in electronic instrumentation
4. Familiarisation of general principles of equipment maintenance and protection.

Course Outcomes

On successful completion of the course, the students will be able to attain the following COs

Course Outcome		CL	Linked PO	Teaching Hrs
CO1	Understand types of measurement, errors, statistical analysis and bridge method of measurement.	<i>R/U/A</i>	1,2,3,10	07
CO2	Analyze selection criteria, operation and applications of transducers.	<i>R/U/A</i>	1,2,3,10	08
CO3	Understand the operation of PMMC meter, dynamometer, electronic voltmeter and their calibration, conversions.	<i>U/A</i>	1,2,3,10	11
CO4	Understand and analyze different types of Oscilloscopes, function generator and spectrum analyzer.	<i>U/A</i>	1,2,3,5,10	10
CO5	Understand, analyze and working of digital meters, conversion, applications and microprocessor based instruments.	<i>U/A</i>	1,2,3,5,10	10
CO6	Understand and analyze the prevalent troubleshooting procedures and tools.	<i>U/A</i>	1,2,3,5,6,7,10	06
Total sessions				52

Course-PO attainment matrix

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
Electronic Instrumentation & Measurements	3	3	3	--	3	1	1	--	--	3
<p style="text-align: center;">Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed.</p> <p>Method is to relate the level of PO with the number of hours devoted to the COs which address the given PO. If $\geq 40\%$ of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3 If 25 to 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 2 If 5 to 25% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 1 If $< 5\%$ of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed.</p>										

Course content and pattern of marks for SEE

Unit	Unit Name	Teaching Hours	Questions for SEE			Marks	Weightage (%)
			R	U	A		
1	Basics of measurements	07	05	05	10	20	13
2	Transducers	08	05	05	10	20	16
3	Analog meters	11	10	10	10	30	21
4	Testing instruments	10	10	10	10	30	19
5	Digital meters	10	10	10	10	30	19
6	Instrument maintenance	06	--	05	10	15	12
Total		52	40	45	60	145	100

Legend: R- Remember, U-Understand A-Application

Course Contents

Unit 1: Basics of measurements

07 Hours

Necessity of measurements-direct and indirect methods, basic terminology, dynamic characteristics of an instrument, generalized electronic measurement system, **Errors**-gross, systematic and random errors, sources of errors. **Statistical analysis**-problems involving arithmetic mean, deviation, average deviation, standard deviation. Limiting errors and probable errors. **Standards**-primary, secondary, working and IEEE standards. Comparison of AC and DC bridges. Principle of Wheatstone bridge and mention its applications.

Unit 2: Transducers

08 Hours

Necessity of electrical transducers, selection of a transducer, active, passive, analog and digital transducers. **Strain gauge**-principle, gauge factor, features of bonded, unbonded, wire and foil type strain gauges, load cell. Principle of working & features of capacitive transducer, Hall effect type, LVDT, thermistor, thermocouple, piezoelectric, proximity sensors, digital optical encoders & PIR sensors.

Unit 3: Analog meters

11 Hours

Principle of PMMC meters, DC ammeters and voltmeters using PMMC. Shunt and series resistors, multi range voltmeters/ammeters, loading effect and voltmeter sensitivity, problems on extending range. Working of electrodynamic type voltmeter, ammeter and wattmeter.

Electronic voltmeters: Pros and cons, working of FET input, chopper type DC amplifier voltmeter, solid-state voltmeter using op-amp, AC voltmeter using full-wave rectifier, Peak responding and true RMS voltmeters. Ohmmeters series and shunt type. Concept of Calibration of meters.

Unit 4: Testing instruments

10 Hours

Cathode Ray Oscilloscope-block diagram, working of CRT, concept of dual tracing. CRO probes: direct, high impedance, active and current probes. Applications of CRO-simple problems on voltage and frequency measurements. **DSO:** block diagram, advantages and applications. **Sampling oscilloscope:** advantages and applications. **Function generator:** block diagram, features and applications. Features of standard RF signal generator and sweep frequency generator. Features of distortion analyzer, wave analyzers, and spectrum analyzers.

Unit 5: Digital meters

10 Hours

Digital instruments - pros and cons, working of ramp and successive approximation type digital voltmeters. Automatization in digital meters-mechanism of automatic zeroing, polarity indication and auto ranging. **Electronic counters**-decade counters as an electronic counter, totalizing, frequency mode, ratio mode, period mode and time interval mode. **Digital meters:** digital frequency meter, time interval measurement, digital LCR meter, digital multimeter, microprocessor-based instruments, IEEE 488 GPIB instruments.

Unit 6: Instrument maintenance

06 Hours

Concepts and need of electrical grounding and shielding, shielding of cabinets, precautions in instrument usage, precautions for instrument safety. **Interference**-nature, causes, effects and prevention. Generalized trouble shooting.

References

1. *Electronic Measurements and Instrumentation -2nd Revised Edition*, R. K. Rajput, ISBN: 81-219-2917-2
2. *Electronic Measurements and Instrumentation-3rd Edition*, Sanjay Talbar & Akhilesh Upadhyaya, ISBN :81-874-3335-3
3. *Electronic Instrumentation -3rd Edition*, Kalsi H. S., ISBN: 00-707-0206-3
4. *Modern Electronic Instrumentation and Measurement Techniques-2nd Edition*, Albert Helfrick & William Cooper, ISBN:81-203-0752-6

Course Delivery

The course will be delivered through lectures, presentations and support of modern tools. Student activities are off-class.

Course Assessment and Evaluation Scheme

Master Scheme

Assessment Method	What		To Whom	Assessment mode /Frequency /timing	Max. Marks	Evidence Collected	Course Outcomes
Direct assessment	CIE	IA	Students	Three tests ⁺	15	Blue Books	1 to 6
				Quiz [@]	05	Quiz Sheet	1 to 5
				Activity*	05	Activity report	1 to 6
	SEE	End exam		End of the course	100	Answer Scripts at BTE	1 to 6
				Total	125		
Indirect assessment	Student feedback on course		Students	Middle of the Course	Nil	Feedback Forms	1 to 3 Delivery of course
	End of course survey			End of the Course	Nil	Questionnaires	1 to 6 Effectiveness of delivery instructions & assessment methods

Legends: CIE-Continuous Internal Evaluation, SEE- Semester End-exam Evaluation

⁺ Every I.A. test shall be conducted for 15 marks. Average of three tests, by rounding off any fractional part thereof to next higher integer, shall be considered for IA.

*Students should do activity as per the list of suggested activities/ similar activities with prior approval of the teacher. Activity process must be initiated well in advance so that it can be completed well before the end of the term.

[@] Quiz conduction shall be evidenced with quiz sheets and it can be conducted any time before the end of the term

Questions for CIE and SEE will be designed to evaluate the various CLs as per the weightage shown in the following table.

Sl. No.	Cognitive Levels (CL)	Weightage (%)
1	Remembering	30
2	Understanding	30
3	Applying	40
Total		100

Continuous Internal Evaluation (CIE) pattern

(i) Student Activity (5 marks)

The following student activities or similar activities can be assigned for assessing CIE (IA) marks

Sl. No.	Activity
1	(a) Collect the standard specifications of at least ten instruments. OR (b) Suggest cost-quality effective instruments of at least five different instruments by preparing comparative statements containing function, specification, make, market-price, and warranty.
2	(a) Collect service manuals of at least five instruments. OR (b) Prepare a document on calibration types and procedures of at least two instruments.
Execution Mode: <ol style="list-style-type: none"> Above two activities or two similar activities can be assigned by the teacher per batch; each batch can have at most 2 students. Activities shall be carried out batch-wise throughout the semester and submit the report before the end of the semester. Report shall be qualitative and as concise as possible. Each of the activity can be carried out off-class; however, demonstration/presentation if necessary, shall be done in the class room. Teacher is expected to observe and record the progress of students' activities Assessment shall be made based on quality of activity, presentation/demonstration and report in accordance with the following rubrics table 	

(ii) Model of rubrics for assessing student activity

Dimension	Scale					Marks (Example)
	1 Unsatisfactory	2 Developing	3 Satisfactory	4 Good	5 Exemplary	
1. Research and gathering information	Does not collect information relate to topic	Collects very limited information, some relate to topic	Collects basic information, most refer to the topic	Collects more information, most refer to the topic	Collects a great deals of information, all refer to the topic	3
2. Full-fills team roles and duties	Does not perform any duties assigned to the team role	Performs very little duties	Performs nearly all duties	Performs almost all duties	Performs all duties of assigned team roles	2
3. Shares work equality	Always relies on others to do the work	Rarely does the assigned work, often needs reminding	Usually does the assigned work, rarely needs reminding	Always does the assigned work, rarely needs reminding.	Always does the assigned work, without needing reminding	5
4. Listen to other team mates	Is always talking, never allows anyone to else to speak	Usually does most of the talking, rarely allows others to	Listens, but sometimes talk too much,	Listens and talks a little more than needed.	Listens and talks a fare amount	3

		Speak				
Total marks						ceil(13/4)= 4

(iii) CIE/IA Tests (15 Marks)

Three tests have to be conducted, during specified schedule, in accordance with the test pattern given below and their average-marks shall be considered for CIE/IA.

(iv) Format of CIE/IA test question paper

CIE Question Paper					
Institution Name and Code					
Course Co-ordinator/Teacher					
<i>Program Name</i>		<i>Test No.</i>		<i>Units</i>	
<i>Class/Sem</i>		<i>Date</i>		<i>CL</i>	
<i>Course Name</i>		<i>Time</i>		<i>COs</i>	
<i>Course Code</i>		<i>Max. Marks</i>	15	<i>POs</i>	
Note to students: Answer all questions					
Question No.	Question	Marks	CL	CO	PO
1					
2					
3					
4					

Legends: PO-Program Outcome, CO-Course outcome, CL-Cognitive Level, R-Remember, U-Understand, A-Apply

Note: Internal choice may be given in each CO at the same cognitive level (CL).

(v) Model question paper for CIE

CIE Question Paper					
Institution Name and Code					
Course Co-ordinator/Teacher					
<i>Program Name</i>	Electronics and Communication	<i>Test No.</i>	1	<i>Units</i>	1 & 2
<i>Class/Sem</i>	3 rd Sem	<i>Date</i>	1/1/2017	<i>CL</i>	R/U/A
<i>Course Name</i>	Electronic measurement and instrumentation	<i>Time</i>	10-11AM	<i>COs</i>	1 & 2
<i>Course Code</i>	15EC34T	<i>Max. Marks</i>	15	<i>POs</i>	1, 2 & 3
Note to students: Answer all questions					
No.	Question	Marks	CL	CO	PO
1	A circuit was tuned for resonance by eight different students and the values of resonance frequency in KHz were recorded as 532,548,543,535,546,531,543 and 536. Calculate the arithmetic mean, average deviation and variance.	05	A	1	1,2,3
2	Sketch the schematic of wheat-stone bridge. Identify its limitations	05	U/A	1	1,2
3	Illustrate how load cell can be used for measuring force OR Explain the principle of piezoelectric transducers. List its	05	A/R	2	1,2

applications				
--------------	--	--	--	--

(iv) Quiz for CIE (5 marks)

The teacher is expected to conduct the quiz and collect the quiz sheets as evidence. Quiz may be conducted for higher marks and be scaled down to 5 and fractional part shall be rounded off to the next higher integer. The questions shall cover all CLs.

Semester end-exam evaluation (SEE)

(i) End-exam question-paper pattern

Unit	Unit Name	Study Duration (Hrs.)	No. Questions for end-exam	
			PART – A 5 Marks	PART – B 10 Marks
1	Basics of measurements	07	01	1.5
2	Transducers	08	01	1.5
3	Analog meters	11	02	02
4	Testing instruments	10	02	02
5	Digital meters	10	02	02
6	Instrument maintenance	06	01	01
	Total	52	09 (45 Marks)	10 (100 Marks)

(ii) Model Question Paper

Course Title : **ELECTRONIC MEASUREMENTS AND INSTRUMENTATION**
 Course Code : **15EC34T** Time : **3 Hrs**
 Semester : **THIRD** Max. Marks : **100**

Instructions : 1. Answer any **SIX** question from **Part A** (5x6=30 Marks)
 2. Answer any **SEVEN** full questions from **Part B** (7x10=70 Marks)

Part A

- Following are the set of readings taken by two meters for a true value of 5v.
 Meter A: 4.81v, 4.81v, 4.79v, 4.78V
 Meter B: 4.92V, 5.09V, 4.83V, 5.16V
 Decide the meter with better precision. Justify your answer after defining precision
- Identify a transducer with excellent dynamic response and list its disadvantages and applications.
- Compare the features of electromechanical instruments with electronic meters
- Explain the working of a Ohmmeter whose scale has zero marking on right side.
- Differentiate between alternate and chop methods of obtaining dual trace in a CRO
- Justify the use of delay lines inside a CRO
- List the advantages and disadvantages of digital meters
- Sketch the block diagram of a digital LCR meter
- State the significance of having functional block diagram in a service manual. Draw an example functional block diagram.

Part B

- (a) Define Error. Indicate the ways of reducing systematic and random errors.
(b) Explain IEEE standards
- (a) Compare AC and DC bridges
(b) List the benefits of using electrical transducer
- (a) A strain gauge has an unstrained length of 10cm and a resistance of 100K Ω . When its length reduces to 9.9 cm, the resistance decreases to 98 K Ω . Estimate its gauge factor.
(b) Write a note on proximity sensors
- In a particular application, it is necessary to accurately measure RMS value of sinusoidal, non sinusoidal and complex waveforms. Identify a suitable type of voltmeter and explain its operation.
- (a) A milli Ammeter of 2.5 Ω resistance reads upto 100mA. Estimate the resistance required to transform into a voltmeter of 0-10v. Sketch the relevant circuit.
(b) List the features of electro-dynamometer type instruments.
- (a) Describe the working of DSO
(b) List the applications of sweep frequency generator.
- Describe with a block diagram how function generator produces different types of wave forms. List its applications
- Describe the working of a digital voltmeter which works on the principle of voltage to time conversion.
- (a) Illustrate how an electronic counter can be used in ratio mode
(b) List the features of IEEE488 GPIB
- (a) List the precautions to be taken to achieve personnel safety during servicing
(b) Outline the major benefits of grounding and shielding

Institutional activities (No marks)

The following are suggested institutional activities, to be carried out at least one during the semester. The course teacher/coordinator is expected to maintain the relevant record (Containing, Activity name, Resource persons and their details, duration, venue, student feedback, etc) pertaining to Institutional activities.

Sl. No.	Activity
1	Organize Seminar, workshop or Lecture from experts on the modern trends/developments in instrumentation and measurements.
2	Organize hands-on practice for use of DSO/ECG/Any other modern measuring instrument.
3	Motivate students to take case study on instrumentation/measurements-based mini projects (small applications) to inculcate self and continuous learning.

Model Question Bank

Note: The questions in the question bank are indicative but not exhaustive. Sub-questions on different CLs may be combined to frame 10-marks questions or 10-marks questions given here can be splitted into 5-marks questions if necessary keeping weightage of CLs approximately intact and adhering to SEE end-exam pattern.

UNIT-1: Basics of measurements

5-mark questions

UNDERSTAND

1. Explain the necessity of measurements.
2. Compare the features of AC and DC bridges.

APPLICATION

3. A circuit was tuned for resonance by eight different students and the values of resonance frequency in KHz was recorded as 532, 548, 543, 535, 546, 531, 543 and 536. Calculate the arithmetic mean, average deviation and variance.
4. Sketch the schematic of Wheatstone bridge. Mention its relevance in measurements?
5. Following are the set of readings taken by two meters for a true value of 5v.
Meter A: 4.81V, 4.81V, 4.79V, 4.78V
Meter B: 4.92V, 5.09V, 4.83V, 5.16V
Choose the meter with better precision. Justify your answer after defining precision.

10-mark Questions

REMEMBER

1. Define speed of response, dynamic error, accuracy, fidelity and resolution w.r.t measurements
2. Define precision, error log, instrument and sensitivity w.r.t measurements.

UNDERSTAND

1. (a) Define error. Indicate the ways of reducing systematic and random errors.
(b) Explain IEEE standards

UNIT-2: Transducers

5-mark questions

REMEMBER

1. List the factors which decide the selection of a transducer
2. List the features of PIR sensors

UNDERSTAND

1. Discuss the necessity of transducers
2. Compare strain gauges with capacitive transducers
3. Compare the features of wire type and foil type strain gauges

APPLICATION

4. Write a note on PIR sensors
5. Explain the principle of piezoelectric transducers. list its applications

10-mark Questions

UNDERSTAND

1. Explain active, passive, analog and digital transducers. Give an example for each

APPLICATION

2. (a) Illustrate how load cell can be used for measuring force

- (b) List the benefits of using electrical transducer
3. (a) A strain gauge has an unstrained length of 10cm and a resistance of 100K Ω . when its length reduces to 9.9 cm, the resistance decreases to 98 K Ω . Calculate its gauge factor.
 (b) Write a note on proximity sensors

UNIT-3: Analog Meters

5-mark Questions

REMEMBER

1. Define calibration and summarize the calibration process of any instrument of your choice.

UNDERSTAND

1. Compare the features of electromechanical instruments with electronic meters
 2. Explain the working of Ohmmeter whose scale has zero marking on right side.

10-mark Questions

APPLICATION

1. In a particular application, it is necessary to accurately measure RMS value of sinusoidal, non sinusoidal and complex waveforms. Choose a suitable type of voltmeter and explain its operation.
 2. (a) A milli ammeter of 2.5 Ω resistance reads up to 100mAs. Calculate the resistance required to transform into a voltmeter of 0-10v. Sketch the relevant circuit
 (b) List the features of electro-dynamometer type instruments

UNIT-4: Testing instruments

5-mark Questions

REMEMBER

1. List the applications of CRO
 2. List the applications of DSO
 3. List the applications of spectrum analyzer

UNDERSTAND

4. Explain the working of a standard RF signal generator
 5. Differentiate between alternate and chop methods of obtaining dual trace in a CRO

APPLICATION

6. Choose a suitable oscilloscope for VHF operations. List its advantages and disadvantages
 7. Justify the use of delay lines inside a CRO
 8. Choose suitable CRO probe for (i) small signal operations
 (ii) Current measurement. List their features
 9. Choose suitable CRO probe (i) used for HF and high impedance operations
 (ii) which utilizes a FET. List their features

10-mark Questions

REMEMBER

1. List the applications of sweep frequency generator, distortion analyses and wave analyzer.

UNDERSTAND

1. Explain the working of CRT with a neat sketch
 2. (a) Describe the working of DSO
 (b) List the applications of sweep frequency generator.

APPLICATION

3. Explain with a block diagram how function generator produces different types of wave forms.
List its applications
4. Explain the working of a CRO with a block diagram

UNIT-5: Digital Meters

5-mark Questions

REMEMBER

1. List the advantages and disadvantages of digital meters

UNDERSTAND

2. Compare analog meters with digital meters

APPLICATION

3. Sketch the block diagram of a digital LCR meter
4. Sketch the block diagram of a digital frequency meter. list its advantages.
5. Show how time gap between two events can be measured digitally.

10-mark Questions

REMEMBER

1. (a) Illustrate how an electronic counter can be used in ratio mode
(c) List the features of IEEE488 GPIB

UNDERSTAND

2. Explain the working of a successive approximation type digital voltmeter
3. Explain the working of a digital LCR meter

APPLICATION

4. Explain the working of a digital voltmeter which works on the principle of voltage to time conversion.
5. (a) Sketch the block diagram of a digital multimeter
(b) Write a brief note on microprocessor based instruments

UNIT-6: Instrument Maintenance

5-mark Questions

REMEMBER

1. List the precautions to be taken to achieve personnel safety during servicing
2. List the causes of interference

UNDERSTAND

1. Describe the role of functional block diagram in servicing.
2. Explain how shielding reduces interference.
3. Explain how grounding reduces interference

APPLICATION

1. Write the significance of having functional block diagram in a service manual. Draw an example functional block diagram

10-mark Questions

REMEMBER

1. List the precautions to be taken to prevent instrument damage during servicing.

UNDERSTAND

1. Explain the procedure of generalized trouble shooting with a flow chart.

APPLICATION

2. List the methods of preventing interference
3. (a) List the precautions to be taken to achieve personnel safety during servicing
(b) Outline the major benefits of grounding and shielding

End

Government of Karnataka
Department of Technical Education
Board of Technical Examinations, Bengaluru

Course Title: Analog Electronics and Communication Lab	Course Code : 15EC35P
Semester : Third	Course Group : Core
Teaching Scheme in Hrs (L:T:P) : 0:2:4	Credits : 3
Type of course : Tutorial + Practical	Total Contact Hours : 78
CIE : 25 Marks	SEE : 50 Marks

Prerequisites

Basics of electrical and electronics engineering and semiconductor devices

Course Objectives

1. Use knowledge of BEEE and SCD to learn construction of regulated power supplies.
2. Study the working of BJT and operational amplifiers-based application circuits.
3. Demonstrate construction and verification of working of basic wave shaping circuits, filters and attenuators
4. Understand working of basic analog communication circuits like AM/FM modulation and demodulation

Course Outcomes

At the end of the course, the students will be able to attain the following Cos

Course Outcome	CL	Experiments linked	Linked PO	Teaching Hrs
CO1 Analyze the working of DC regulated power supplies	<i>U/A</i>	Unit-1: Part A: E1	1 to 10	9
CO2 Illustrate biasing of BJT as RC coupled CE amplifier and analyze its frequency response	<i>U/A</i>	Unit -1: Part A: E2	1 to 10	6
CO3 Analyze operations of Op-amp amplifier applications	<i>R/U/A</i>	Unit -1: Part A: E3-6	1 to 10	15
CO4 Illustrate construction and testing of Diode wave shaping circuits such as Clipper and Clamper.	<i>U/A</i>	Unit -1: Part A: E7-8	1 to 10	6
CO5 Observe the correctness of maximum power transfer theorem and behavior of resonant circuits,	<i>R/U/A</i>	Unit -1: Part B: E1-2	1 to 10	12
CO6 Analyze the circuit diagrams of filters and attenuators, AM & FM modulation and demodulation	<i>R/U/A</i>	Unit -1: Part A: E3-7	1 to 10	15
CIE/IA assessment tests				06
Total				69

Legend: E- Experiment, R-Remember, U-Understand, A-Application, CL-Cognitive Level, PO-Program Outcome

Note: Total sessions include two tests

Course-PO Attainment Matrix

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
Analog electronics and communication lab	3	3	3	3	3	--	--	3	1	3
<p style="text-align: center;">Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed.</p> <p>Method is to relate the level of PO with the number of hours devoted to the COs which address the given PO.</p> <p>If $\geq 40\%$ of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3</p> <p>If 25 to 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 2</p> <p>If 5 to 25% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 1</p> <p>If $< 5\%$ of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed.</p>										

Course Contents

Unit – 1: Tutorial and Graded Exercises

69 Hours

Sl. No	Topic / Exercises	Duration (Hr.)
Part- A		
1	Construct a regulated power supply to generate 12V and note down the voltage/waveform at each stage (Use discreet components/ ICs for sub circuits)	9
2	Construct voltage divider biased single-stage RC coupled CE amplifier and plot frequency response	6
3	Construct and verify Inverting or non inverting amplifier using Op-amp	3
4	Construct and verify summing or difference amplifier using Op-amp	3
5	Construct and verify differentiator or integrator amplifier using Op-amp	3
6	Construct and verify RC phase-shift oscillator circuit using Op-amp	6
7	Construct and test a positive or negative clipper circuit	3
8	Construct and test positive or negative clamper circuit	3
Part-B		
1	Verification of maximum power transfer theorem.	6
2	Plot the frequency response of series resonant circuit and find its bandwidth and Q factor	6
3	Construct and test the passive low-pass T-type filter circuit for a give cut-off frequency	3
4	Construct and test active high-pass filter using Op-amp for a given cut-off frequency and gain	3
5	Construct and test PI type attenuator circuit for the given attenuation & Ro	3
6	Construct and verify amplitude modulation and demodulation using trainer kits	3
7	Construct and verify frequency modulation and demodulation using trainer kits	3
Conduction of CIE/IA tests		6
Total		69

Activity
Prepare module from the list below by placing the components in the General PCB / copper-clad sheet and soldering/wired connection (1) +12v power supply, (2) -12v power supply, (3) +5v power supply, (4) -5v power supply, (5) Half-wave and Full-Wave Rectifier, (6) Half-wave and Full-Wave Rectifier with filter (7) Voltage regulator using Zener diode, (8) Voltage regulator using transistor and op-amp (9) Single stage voltage divider bias RC coupled amplifier, (10) Two stage voltage divider bias RC coupled amplifier, (11) Inverting Amplifier, (12) Non-Inverting amplifier, (13) Inverting Summing Amplifier using op-amp, (14) Non-Inverting Summing Amplifier using op-amp (15) Difference amplifier using op-amp, (16) Differentiator using op-amp, (17) Integrator using op-amp, (19) Comparator using op-amp, (20) Zero cross detector using op-amp, (21) Instrumentation amplifier

Institutional Activity (No marks)

The following are suggested institutional activities. At least one activity or similar activity can be carried out during the semester. The course teacher/coordinator is expected to maintain the relevant record (Containing, Activity name, Resource persons and their details, duration, venue, student feedback, etc) pertaining to Institutional activities.

Sl. No.	Activity
1	A seminar of electronics equipment handling and Lab maintenance
2	A visit to electronics industry/ electronics research labs
3	Organize hands-on practice to construct an application specific module

References

1. *Electronics laboratory primer*, S. Poorna Chandra, B. Sasikala, S. Chand Technical Publication. ISBN 81-219-2459-6
2. *Fundamentals of Electronic Devices and Circuits Laboratory Manual*, David A. Bell Oxford University Press, ISBN 978-0-19-542988-6
3. *Electronic Devices*, Thomas L Floyd, ISBN10: 8177586432

Course Delivery

The course will be delivered through tutorials of two hours and four hours of hands on practice per week. Student activities are off-class and

Course Assessment and Evaluation Scheme

Master Scheme

Assessment Method	What		To Whom	Assessment mode /Frequency /timing	Max. Marks	Evidence Collected	Course Outcomes
Direct assessment	CIE	IA	Students	Two tests ⁺	10	Blue Books	1 to 6
				Record [@]	10	Record Book	1 to 6
				Activity [*]	05	Report/Sheets	1 to 6
	SEE	End exam		End of the course	50	Answer Scripts at BTE	1 to 6
				Total	75		
Indirect assessment	Student feedback on course		Students	Middle of the Course	Nil	Feedback Forms	1 to 3 Delivery of course
	End of course survey			End of the Course	Nil	Questionnaires	1 to 6 Effectiveness of delivery instructions & assessment methods

Legends: CIE-Continuous Internal Evaluation, SEE- Semester End-exam Evaluation

⁺ I.A. test shall be conducted as per SEE scheme of valuation. However obtained marks shall be reduced to 10 marks. Average marks of two tests shall be rounded off to the next higher digit.

Rubrics to be devised appropriately by the concerned faculty to assess Student activities.

^{*} Students should do activity as per the list of suggested activities/ similar activities with prior approval of the teacher. Activity process must be initiated well in advance so that it can be completed well before the end of the term.

[@] Record Writing: Average of marks allotted for each experiment; fractional part of average shall be rounded-off to next higher integer.

Composition of CLs

Sl. No.	Cognitive Levels (CL)	Weightage (%)
1	Remembering	20
2	Understanding	30
3	Applying	50
Total		100

Continuous Internal Evaluation (CIE) pattern

(i) Student Activity (5 marks)

The student activities in Unit-2 or similar activities can be assigned

Execution Notes:

- Activities are assigned batch-wise (maximum of 2 students per batch); any one activity/project per batch should be assigned by the teacher based on interest of the students. Student can also choose any other similar activity with a prior approval from the concerned teacher.
- Teacher is expected to observe and record the progress of students' activities
- Assessment is made based on quality of work as prescribed by the following rubrics table.

(ii) Model of rubrics for assessing student activity (for every student)

Dimension	Scale					Marks (Example)
	1 Unsatisfactory	2 Developing	3 Satisfactory	4 Good	5 Exemplary	
1. Research and gathering information	Does not collect information relate to topic	Collects very limited information, some relate to topic	Collects basic information, most refer to the topic	Collects more information, most refer to the topic	Collects a great deals of information, all refer to the topic	3
2. Full-fills team roles and duties	Does not perform any duties assigned to the team role	Performs very little duties	Performs nearly all duties	Performs almost all duties	Performs all duties of assigned team roles	2
3. Shares work equality	Always relies on others to do the work	Rarely does the assigned work, often needs reminding	Usually does the assigned work, rarely needs reminding	Always does the assigned work, rarely needs reminding.	Always does the assigned work, without needing reminding	5
4. Listen to other team mates	Is always talking, never allows anyone to else to speak	Usually does most of the talking, rarely allows others to speak	Listens, but sometimes talk too much,	Listens and talks a little more than needed.	Listens and talks a fare amount	3
Total marks						ceil(13/4)= 4

(iii) CIE/IA Tests (10 Marks)

Two tests have to be conducted in accordance SEE pattern and the marks shall be scaled down to 10. Average of two tests, rounding-off any fractional part to next higher integer, shall be considered for CIE/IA.

(iv) Record Evaluation (10 Marks)

Every experiment shall be assigned marks, in the scale of 10, after its conduction based on student's performance and quality of write-up. Average of them, by rounding-off any fractional part to next higher integer, shall be considered for CIE/IA.

Semester End-exam Evaluation (SEE) Scheme

Sl. No.	Scheme	Max. Marks
1	Writing two specified circuits/diagrams (one each from part A and part B) with applicable Procedure / Tabular Col./ Ideal graph/ formula calculations	15
2	Construction and conduction of any one circuit	20
3	Result	05
4	Viva-voce	10
TOTAL		50
Note:		
1. Equal weightage for Part A and Part B experiments		
2. Candidate is expected to submit the Lab record for the examination		
3. Student shall not be allowed to conduct directly if he/she is unable to write at least one correct circuit diagram		

Laboratory Resource Requirements

Hardware Requirement for a batch of not more than 20 students

Sl. No.	Equipment	Approx. Quantity
1	Regulated Power supply (1A/2A, 0-30V)	10
2	DC Voltage supply (+/-5V, +/-12V, +/-15V)	10
3	Dual trace oscilloscope (upto 20 to 30MHz)	10
4	Digital multi-meters	10
5	Function/Signal generators	10
6	Amplitude modulation and Demodulation kits	05
7	Frequency modulation and Demodulation kits	05
8	Step down transformer, Capacitors, Resistors, Inductors, BJT, Op-amp IC-741, Regulator IC-7812, Diode	Consumables
9	Single strand wire/Patch cards (different lengths), probes	
10	Bread board / Analog trainer kit	10

Model Questions for Practice and Semester End Examination

Note: These questions are indicative but not exhaustive.

1. Construct a part of regulated power supply to generate 12V supply and measure/record the voltage/waveform at each stage (Using discreet component) (Suggestion: assign only subcircuits of RPS, executable in 3hrs)
2. Construct of voltage divider biased single stage RC coupled CE amplifier and plot frequency response.
3. Construct and verify inverting or non inverting amplifier using Op-amp for gain of 10
4. Construct and verify Summing or Difference amplifier using Op-amp square/sine wave input
5. Construct and verify Differentiator or integrator amplifier using Op-amp for square/sine wave input.
6. Construct and verify RC phase shift oscillator circuit using Op-amp to oscillate at 200Hz
7. Construct a positive or negative clipper circuit and record its output for a given input
8. Construct and verify the functioning of positive or negative clamper circuit
9. Verify of the correctness of maximum power transfer theorem
10. Plot the frequency response characteristics of series resonant circuits and find their Bandwidth and Q factor.
11. Construct and test circuit of passive Low pass filter T-type for cut-off freq f_c Hz
12. Construct and test Active High pass filter using op-amp for a cut-off frequency f_c Hz
13. Design and construct PI attenuator circuit for the given attenuation & R_o
14. Generate amplitude modulated signal and recover the modulating signal from it experimentally
15. Generate frequency modulated signal and recover the modulating signal from it experimentally

End

Government of Karnataka
Department of Technical Education
Board of Technical Examinations, Bengaluru

Course Title: Digital Electronics Lab-2	Course Code : 15EC36P
Credits : 3 Credits	Semester : Third
Teaching Scheme in Hrs (L:T:P) : 0:2:4	Course Group : Core
Type of course : Tutorial + Practical	Total Contact Hours : 78
CIE : 25 Marks	SEE : 50 Marks

Prerequisites

Knowledge of basics of digital electronics and number systems.

Course Objectives

To understand the working of various digital electronics circuits and to design and analyze simple logic circuits.

Course Outcomes

Course Outcome		CL	Linked Experiments	Linked PO	Teaching Hrs
CO1	Identify the various digital ICs and their specifications and applications.	<i>R/U/A</i>	Unit-1: Part A: E1	1,2,3,4,10	6
CO2	Apply the basic knowledge of digital electronics to design simple combinational circuits.	<i>R/U/A</i>	Unit-1: Part A: E2-9	1,2,3,4,10	24
CO3	Analyze the functions of flip-flops various flip-flops	<i>U/A</i>	Unit-1:Part B: E1-3	1,2,3,4,10	09
CO4	Construct and test simple sequential circuits and data converters	<i>R/U/A</i>	Unit-1: Part B: E4-12	1,2,3,4,10	27
CO5	Employ modern tools for the analysis, design and simulation of simple digital circuits.	<i>U/A</i>	Unit-2	1,2,3,4,10	03 and off-classes
CO6	Apply digital electronics concepts and comprehend the recent developments related to digital electronics.-mini project	<i>U/A</i>	Unit 2	1,2,3,4,5,8,9,10	03 and off-classes
Two CIE/IA Tests					06
Total					78

Legend: E- Experiment, R-Remember, U-Understand, A-Application, CL-Cognitive Level, and PO-Program Outcome

Course-PO Attainment Matrix

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
Digital Electronics Lab-2	3	3	3	3	1	--	--	1	1	3
<p style="text-align: center;">Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed.</p> <p>Method is to relate the level of PO with the number of hours devoted to the COs which address the given PO.</p> <p>If $\geq 40\%$ of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3</p> <p>If 25 to 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 2</p> <p>If 5 to 25% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 1</p> <p>If $< 5\%$ of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed.</p>										

Course Contents

Unit – 1: Tutorial and Practice

60 Hours

Sl. No.	Topic/Exercises	Duration (Hr.)
Group A: Combinational Circuits		24
1	(i) Identify various IC (digital, analog, mixed) packages and families and learn to identify pin numbers in different packages. (ii) Practice handling of ICs with precautions and know IC soldering methods.	6
2	Verify the functionality of 2:1 or 4:1 multiplexer using suitable gates	3
3	Construct 4:1 multiplexer using 2:1 multiplexer IC and verify the operation.	3
4	Realise basic gates or simple logic expressions using multiplexer IC.	3
5	Verify the operation of 1:2 or 1:4 demultiplexer using suitable IC.	3
6	Verify the operation of BCD to Decimal decoder using suitable IC.	3
7	Construct and verify the circuit to translate BCD to decimal digits in seven-segment display using suitable IC	3
8	Verify the operation of decimal to BCD encoder using suitable IC.	3
9	Illustrate the storing and retrieving of data in RAM using suitable IC.	3
Group B: Sequential Circuits		
1	Construct clocked SR FF using gates and verify its functionality.	3
2	Verify the TT of JK FF using IC 7476. Observe the role of preset and clear inputs.	3
3	Realize D-FF and T-FF using JK FF and observe the timing diagrams.	3
4	Move 3-bit or 4-bit data in SISO and PISO modes using FFs and tabulate the data movement in each mode.	3

5	Move or 4-bit data in SISO, SIPO, PIPO, PISO modes using suitable IC and tabulate the data movement in each mode.	3
6	Construct 3-bit ripple counter (both up and down separately) using flip-flop IC 7476 and verify its truth table	3
7	Configure IC 7490 as mod 10 counter and verify its truth table	3
8	Verify the operation of a 3-bit or 4-bit ring and Johnson's counter using suitable flip-flop IC	3
9	Construct astable multivibrator using timer IC 555 to generate square output waveform for a given frequency.	3
10	Construct monostable multivibrator using timer IC-555 to generate pulses of different ON periods.	3
11	Convert digital data to analog signal using suitable DAC IC and observe the output for various inputs and find the resolution and accuracy.	3
12	Convert analog signal to digital using suitable ADC IC and observe the output for various inputs and find the resolution and accuracy.	3
Two CIE/IA Tests		6
Total		66

Unit – 2: Student Activities [CIE- 05 Marks]

06 Hours

Sl. No.	Activity	Duration (Hr.)
1	Collect the information on the memory system of a computer used in the lab.	3
2	Simulate the working of any simple logic circuit using a suitable modern software tool.	3

Institutional Activity (No marks)

The following are suggested institutional activities, to be carried out at least one during the semester. The course teacher/coordinator is expected to maintain the relevant record (Containing, Activity name, Resource persons and their details, duration, venue, student feedback, etc) pertaining to Institutional activities

Sl. No.	Activity
1	Organize hands-on practice on design and simulation of digital circuits.
2	Motivate student to take case study on different ASICs (Application specific ICs) digital circuits to inculcate self and continuous learning.

References

1. *Digital Principles and Applications*, Donald P Leach, Albert Paul Malvino, Goutam Saha, McGraw-Hill publications.8e
2. *Digital Systems Principles and Applications*, Ronald J. Tocci, Neal S Widmer, Gregory L. Moss. Pearson Publication.

3. *Digital Electronics –principles and Integrated circuits* ,Anil K.Maini,wiley India edition.
4. <https://www.circuitlogix.com>
5. <http://www.vlab.co.in/>
6. www.electronicforu.com/
7. www.electronicprojects.org/
8. <http://www.asic-world.com/>
9. <http://www.freebyte.com>
10. <http://www.electronics-tutorials>
11. <http://www.circuitstoday.com>
12. <http://www.allaboutcircuits.com>

Course Delivery

The course will be delivered through two-hour tutorials and four-hour hands-on practice per week. Tutorial shall be imparted before the conduction of the experiment. Student activities are off-class and presentation/report evaluation is during assigned lab sessions.

Course Assessment and Evaluation Scheme

Master Scheme

Assessment Method	What		To Whom	Assessment mode /Frequency /timing	Max. Marks	Evidence Collected	Course Outcomes
Direct assessment	CIE	IA	Students	Two tests ⁺	10	Blue Books	1 to 6
				Record [@]	10	Record Book	1 to 6
				Activity*	05	Report/Sheets	1 to 6
	SEE	End exam		End of the course	50	Answer Scripts at BTE	1 to 6
				Total	75		
Indirect assessment	Student feedback on course		Students	Middle of the Course	Nil	Feedback Forms	1 to 3 Delivery of course
	End of course survey			End of the Course	Nil	Question-naires	1 to 6 Effectiveness of delivery instructions & assessment methods

Legends: CIE-Continuous Internal Evaluation, SEE- Semester End-exam Evaluation

I.A. test shall be conducted as per SEE scheme of valuation. However obtained marks shall be reduced to 10 marks. Average marks of two tests shall be rounded off to the next higher digit.

Rubrics to be devised appropriately by the concerned faculty to assess Student activities.

*Students should do activity as per the list of suggested activities/ similar activities with prior approval of the teacher. Activity process must be initiated well in advance so that it can be completed well before the end of the term.

@ Record Writing: Average of marks allotted for each experiment; fractional part of average shall be rounded off to next higher integer.

Composition of CLs

Sl. No.	Cognitive Levels (CL)	Weightage (%)
1	Remembering	25
2	Understanding	40
3	Applying	35
Total		100

Continuous Internal Evaluation (CIE) pattern

(i) Student Activity (5 marks)

The student activities in Unit-2 or similar activities can be assigned

Execution Notes:

- Activities are assigned batch-wise (maximum of 2 students per batch); any one activity/project per batch should be assigned by the teacher based on interest of the students. Student can also choose any other similar activity with a prior approval from the concerned teacher.
- Teacher is expected to observe and record the progress of students' activities
- Assessment is made based on quality of work as prescribed by the following rubrics table.

(ii) Model of rubrics for assessing student activity (for every student)

Dimension	Scale					Marks (Example)
	1 Unsatisfactory	2 Developing	3 Satisfactory	4 Good	5 Exemplary	
1. Research and gathering information	Does not collect information relate to topic	Collects very limited information, some relate to topic	Collects basic information, most refer to the topic	Collects more information, most refer to the topic	Collects a great deals of information, all refer to the topic	3
2. Full-fills team roles and duties	Does not perform any duties assigned to the team role	Performs very little duties	Performs nearly all duties	Performs almost all duties	Performs all duties of assigned team roles	2
3. Shares work equality	Always relies on others to do the work	Rarely does the assigned work, often needs reminding	Usually does the assigned work, rarely needs reminding	Always does the assigned work, rarely needs reminding.	Always does the assigned work, without needing reminding	5
4. Listen to other team mates	Is always talking, never allows anyone to else to speak	Usually does most of the talking, rarely allows others to speak	Listens, but sometimes talk too much,	Listens and talks a little more than needed.	Listens and talks a fare amount	3
Total marks						ceil(13/4)= 4

(iii) CIE/IA Tests (10 Marks)

Two tests have to be conducted in accordance SEE pattern and the marks shall be scaled down to 10. Average of two tests, rounding-off any fractional part to next higher integer, shall be considered for CIE/IA.

(iv) Record Evaluation (10 Marks)

Every experiment shall be assigned marks for a scale of 10 after its conduction based on student's performance and quality of write-up. Average of them, by rounding-off any fractional part to next higher integer, shall be considered for CIE/IA.

Semester End-exam Evaluation (SEE) Scheme

Sl. No.	Scheme	Max. Marks
1	Writing two circuit diagrams (one from part A and one from part B) with applicable Procedure / Tabular/ Ideal graph/ formula for calculations	20
2	Construction and conduction of any one circuit	15
3	Result	05
4	Viva-voce	10
TOTAL		50
Note: 1. Candidate is expected to submit the Lab record for the examination 2. Student shall not be allowed to conduct directly if he/she is unable to write at least one correct circuit diagram		

Laboratory Resource Requirements

Hardware Requirement: For a batch of 20 students

Sl. No.	Equipment	Quantity
1	Digital trainers	10
2	Dual trace oscilloscope.	05
3	Digital multimeters	05
4	ICS- 7400,7402,7404,7408,7432,7486,7442,7445,7446,7474,7476,7427,7489,7490,7494,7495,74141,74148,74153,74157,74155,74193,74194,DAC0808,A DC-0800,741,555 timer	10 each
5	Patch cards(different lengths)	250
6	Digital IC Tester	02

Model Questions for Practice and Semester End Examination

Note: The questions in the question bank are indicative but not exhaustive.

GROUP A

1. Verify the functionality of 4:1 or 2:1 multiplexer choosing suitable IC.
2. Design and verify the equation $y = \bar{A}B + A\bar{B}$ using suitable multiplexer IC.
3. Modify a 2:1 multiplexer IC to work as a 4:1 multiplexer and show the operation.
4. Demonstrate the operation of a decoder circuit.
5. Design a circuit to display decimal numbers on a common anode/cathode seven segment display..
6. Verify the functionality of an encoder circuit.
7. Verify the operation of a decimal to BCD encoder.
8. Verify the read and write operation on a RAM using suitable IC.

9. Construct Astable multivibrator using timer IC 555 to generate square output waveform for a frequency.
10. Construct Astable multivibrator using timer IC 555 with $R_A = R_B = 1\text{k ohms}$ and $c = 1000$ microfarads and compare the theoretical and practical frequency of oscillation.
11. Construct Monostable multivibrator using timer IC 555 to generate pulses for a given ON periods.
12. Use timer IC 555 as a one shot and show the output waveform.

GROUP B

13. Choose suitable logic gates to construct and identify the output of an S-R FF.
14. Verify the operation of a clocked S-R FF.
15. Verify the operation of a J-K FF.
16. Verify the operation of a J-K FF and show the role of preset and clear inputs.
17. Verify the operation of a D FF.
18. Verify the operation of a T FF.
19. Convert JK FF to a D FF and verify the operation.
20. Modify JK FF to a T- FF and show that it divides the clock input frequency by 2.
21. Verify the operation of SISO shift register.
22. Verify the operation of SIPO shift register.
23. Verify the operation of PISO shift register.
24. Verify the operation of PIPO shift register.
25. Verify the operation of 3-bit asynchronous Up-counter.
26. Verify the operation of 3-bit asynchronous down-counter.
27. Verify the operation of mod-10 counter with the help of IC 7490.
28. With the help of IC 7474, construct a 3-bit ring counter and verify the operation.
29. With the help of IC 7474, construct a 3-bit Johnson's counter and verify the operation.
30. Design and verify the working of mod-5 asynchronous counter using FFs.
31. Design a mod-3 synchronous counter and verify the operation.
32. Use DAC 0808 or any other similar ICs and tabulate the output for different values of inputs.
33. Use ADC 0800 or any other similar ICs and tabulate the output for different values of inputs.

End

Government of Karnataka
Department of Technical Education
Board of Technical Examinations, Bengaluru

Course Title	: C- Programming Lab	Course Code	: 15EC37P
Semester	: Third	Credits	: 3 Credits
Teaching Scheme in Hrs (L:T:P)	: 0:2:4	Course Group	: Core
Type of course	: Tutorial + Practical	Total Contact Hours	: 78
CIE	: 25 Marks	SEE	: 50 Marks

Prerequisite

Basics of digital electronics and number systems, and logical thinking

Course Objectives

1. Understand the need for high-level languages, particularly C, and programming paradigms.
2. Familiarize with program-development environment and development of simple programs in C
3. Understand the need and role of data-structures such as arrays, strings and pointers, and functions in C-program development.

Course Outcomes

At the end of the course, the students will be able to attain the following COs

Course Outcome		CL	Experiments linked	Linked PO	Teaching Hrs
CO1	Appreciate the necessity and evolution of the computer language and selection of programming paradigms.	R/U/A	Unit-1 Chapter 1	1,2,4,10	5
CO2	Perform algorithm development, its representation using flow-charts and analysis of solution for simple problems.	R/U/A	Unit 1 Chapter1, 2,3,4,5,6 and practice programs	1,2,3,4,10	31
CO3	Employ C-programming language for simple real-world problem-solving using computer.	R/U/A	Unit 2 Programs 1 to 6	1,2,3,4,5, 10	18
CO4	Develop and analyze simple programs/functions and their integration in larger problem solving.	R/U/A	Unit 2 Programs 7 to 11	1,2,3,4,5, 10	18
Two CIE/IA Tests					06
Total					78

Legend: E- Experiment, R-Remember, U-Understand, A-Application, CL-Cognitive Level, PO-Program Outcome

Note: Total sessions include two tests

Course-PO Attainment Matrix

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
C- Programming Lab	3	3	3	3	3	--	--	--	--	3
<p style="text-align: center;">Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed.</p> <p>Method is to relate the level of PO with the number of hours devoted to the COs which address the given PO. If $\geq 40\%$ of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3 If 25 to 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 2 If 5 to 25% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 1 If $< 5\%$ of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed.</p>										

Course Contents

Unit-1: Tutorials and Practice Exercises

36 Hours

Tutorial		
Sl. No.	Topic/Exercises	Duration (Hr.)
1	<p>Introduction Definition, need, and types of programming languages and their selection criterion.</p> <ul style="list-style-type: none"> • Need for programming language • Computer programming languages: Machine language, assembly/low-level language, middle-level language and high-level languages. Features and advantages and disadvantages. • Algorithm and methods of writing algorithms: pseudo-code and flow-charts • Features of pseudo-code or flow-charts • Programming paradigms: Features of procedure oriented programming (POP) and object oriented programming (OOP) paradigms • Program development process (writing, editing, compilation, linking, execution and debugging and file extensions) and tools • Programming errors: Syntax, semantic, linker, and run-time (logical and data) errors • C-program format • Introduction to standard input and output statements • Variables and constants: Definition, naming (identifiers or labels for different entities), initialization and accessing of variables. Constants and their representation • Data types: classification, memory requirement, range of values, usage and type specifiers 	10

	<ul style="list-style-type: none"> • Operators and Operands: Unary, binary and ternary operators. Arithmetic, logical, relational, combinational-assignment and special operators. Precedence and associativity. Unary and binary operands • Statements- tokens and expressions • Type casting-automatic and forced • Escape characters • I/O statements in detail 	
2	Control structure <ul style="list-style-type: none"> • Branching: Conditional (<i>if, if-else</i>, nested and ladder <i>if-else, switch</i> constructs) and unconditional (<i>break, continue</i> and <i>goto</i> statements) • Looping: Entry-controlled (<i>for</i> and <i>while</i>) and exit-controlled (<i>do while</i>) loops 	06
3	Arrays/Matrices, strings and pointers <ul style="list-style-type: none"> • Definition, declaration, initialization (static and run-time or dynamic) of arrays, strings and pointers • Accessing of strings, arrays (one and two dimensional), and pointers 	06
4	Functions <ul style="list-style-type: none"> • Concept, pros and cons, classification, creation and application of functions • Parameter passing: Pass by value and address methods • Library and user-defined functions • Recursive and non-recursive functions • Data visibility and longevity 	05
5	User-defined data-type <ul style="list-style-type: none"> • Definition, declaration, initialization of members and variables of structures and unions • Distinction between structures and unions • Accessing of members of structures and unions 	06
6	Macros Definition, classification and application of macros in program development	03
Total Duration (Hr.)		36
Practice Exercises		
1.	Write algorithm, flow-chart and program for the following problems (Assume relevant data if necessary and right units. Search and use library functions wherever possible). <ol style="list-style-type: none"> 1. Display your country name and beep at the end. 2. Display the following text: C was developed by “Dennis M Ritchie” in 1972 3. Compute the area and circumference of a circle given the radius 4. Compute simple interest given the interest rate, principal and duration 	

	<ol style="list-style-type: none"> 5. Compute compound interest given the interest rate, principal, compounding-nature and duration 6. Swap contents of two variables without using intermediate variables 7. Display expenditure incurred against each item, such as fee receipt 8. Factorial of a single digit number 9. Absolute value of a number 10. Verify if the given number is prime or not 11. Largest of three numbers using if-else and ternary operators 12. Logarithm of a number. 13. $\sin(\theta_1 + \theta_2) + \cos(\theta_1 - \theta_2)$ given θ_1 and θ_2 in degrees 14. Average of N numbers read through keyboard (i.e., at run-time) 15. Average of the numbers in an $N \times M$ matrix 16. Search a number in an array of N integers 17. Verify Pythagoras theorem. 18. Compute the area and circumference of a circle given the radius using macro for π. 19. Find smallest of three numbers using macro 20. Use function to swap contents of two variables using (a) by <i>pass-by-value</i> and (b) <i>pass-by-address</i> methods
2	<p>Analysis of the program</p> <p>Given the program or block of program code, analyze the same and record the output or error, as the case may be. Justify your answer. Examples,</p> <ol style="list-style-type: none"> 1. <pre>#include<stdio.h> main() { int k=5, l=24; printf("%f", k/l); }</pre> 2. <pre>#include<stdio.h> main() { printf("Saying by Mahatma\tGhandiji: \nWhat can\'t be tolerated must be endured"); }</pre> 3. <pre>int i; for (i=1; i<10; i--);</pre>

Unit – 2: Graded Exercises

42 Hours

Write the algorithm/flow-chart and code for the following problems

Note: Assume appropriate data and units wherever necessary. Library functions, unless specified, can be used wherever necessary.

Sl. No.	Graded Exercises	Duration (Hr.)
1	Given the resistance and standard tolerance, generate the color bands of the resistor	3
2	Given the total marks, generate the result-class of a student	3

3	Given an alphabet, display whether it is VOWEL or CONSONANT	3
4	Multiply two matrices using array-subscript method	3
5	Add two matrices using pointers	3
6	Given a string, reverse it using your own code and a library function; compare the time consumed in both approaches	3
7	Given x in radians, compute $\sin(x)$ using series method and the corresponding library function; compare both methods for execution time.	3
8	Create a structure to represent a <i>book</i> and declare an array of N variables of the type <i>book</i> and sum and display the cost members of all the book variables	3
9	Simulate the arithmetic calculator	3
10	Sort a list of N numbers using user defined function	3
11	Two open-ended experiments of similar nature and magnitude of the above are to be assigned by the teacher (Student is expected to solve and execute/simulate independently. Open-ended programs covered here shall not be included in the exam)	6
	Two Internal Assessment Tests	6
	Total	42

Unit – 3: Student Activity for CIE

Sl. No.	Activity
1	Prepare/Collect notes pertaining to Unit-1 and solve practice programs specified in Unit-1
2	Collect or write any 10 programs (open-ended) not specified in Unit-1 or Unit-2
3	Prepare a list of high-level programming languages, collect features of any five such high-level programming languages and collect/prepare material on C-program development tools and their usage.

Institutional Activity (No marks)

The following are suggested institutional activities, to be carried out at least one during the semester. The course teacher/coordinator is expected to maintain the relevant record (Containing, Activity name, Resource persons and their details, duration, venue, student feedback, etc) pertaining to Institutional activities

Sl. No.	Activity
1	Organize hands-on practice on installation of Compilers and use of IDE for program development.
2	Organize seminar on free-open source software
3	Conduct quiz on C programming

References

1. C Programming By Balaguruswamy, TMH Publishers, ISBN-10: 8131716813, 2009.
2. C Programming By Kernighan and Dennis Ritchie

Course Delivery

The idea behind this course delivery is to provide relevant tutorial and hands-on practice concurrently. The course will be normally delivered through two-hour tutorials and four-hour hands-on practice per week; hands-on practice shall include practice exercises and graded exercises. Normally, one-hour tutorial followed by two-hour hands-on practice is recommended in each class. In Unit-1, tutorials and practice may be carried out concurrently. However, graded exercise (Unit-II) can also be covered at appropriate point of tutorials of Unit-1. Activities are carried-out off class.

Course Assessment and Evaluation Scheme

Master Scheme

Assessment Method	What		To Whom	Assessment mode /Frequency /timing	Max. Marks	Evidence Collected	Course Outcomes
Direct assessment	CIE	IA	Students	Two tests ⁺	10	Blue Books	1 to 4
				Record [@]	10	Record Book	1 to 4
				Activity [*]	05	Report/Sheets	1 to 4
	SEE	End exam		End of the course	50	Answer Scripts at BTE	1 to 4
				Total	75		
Indirect assessment	Student feedback on course		Students	Middle of the Course	Nil	Feedback Forms	1 to 4 & Delivery of course
	End of course survey			End of the Course	Nil	Questionnaires	1 to 4, Effectiveness of delivery instructions & assessment methods

Legends: CIE-Continuous Internal Evaluation, SEE- Semester End-exam Evaluation

1. I.A. test shall be conducted as per SEE scheme of valuation. However obtained marks shall be reduced to 10 marks. Average marks of two tests shall be rounded off to the next higher digit.
2. Rubrics to be devised appropriately by the concerned faculty to assess Student activities.

*Students should do activity as per the list of suggested activities/ similar activities with prior approval of the teacher. Activity process must be initiated well in advance so that it can be completed well before the end of the term.

@ Record Writing: Average of marks allotted for each experiment; fractional part of average shall be rounded-off to next higher integer.

Composition of CLs

Sl. No.	Cognitive Levels (CL)	Weightage (%)
1	Remembering	20
2	Understanding	30
3	Applying	50
Total		100

Continuous Internal Evaluation (CIE) pattern

(i) **Student Activity (5 marks):** The student activities in Unit-3 or similar activities can be assigned by the teacher

Execution Notes:

- Each batch of 2 students is assigned at least one activity listed in Unit-3 based on interest of the students. Student can also choose any other similar /relevant activity with prior approval from the concerned teacher.
- Teacher is expected to observe and record the progress of students' activities
- Assessment is made based on quality of work as prescribed by the following **rubrics** table

(ii) Model of rubrics for assessing student activity (for every student)

Dimension	Scale					Marks (Example)
	1 Unsatisfactory	2 Developing	3 Satisfactory	4 Good	5 Exemplary	
1. Research and gathering information	Does not collect information relate to topic	Collects very limited information, some relate to topic	Collects basic information, most refer to the topic	Collects more information, most refer to the topic	Collects a great deals of information, all refer to the topic	3
2. Full-fills team roles and duties	Does not perform any duties assigned to the team role	Performs very little duties	Performs nearly all duties	Performs almost all duties	Performs all duties of assigned team roles	2
3. Shares work equality	Always relies on others to do the work	Rarely does the assigned work, often needs reminding	Usually does the assigned work, rarely needs reminding	Always does the assigned work, rarely needs reminding.	Always does the assigned work, without needing reminding	5
4. Listen to other team mates	Is always talking, never allows anyone to else to speak	Usually does most of the talking, rarely allows others to speak	Listens, but sometimes talk too much,	Listens and talks a little more than needed.	Listens and talks a fare amount	3
Total marks						ceil(13/4)= 4

(iii) CIE/IA Tests (10 Marks)

Two tests shall be conducted in accordance with SEE pattern and the marks shall be scaled down to 10. Average of two tests, rounding-off any fractional part thereof to next higher integer, shall be considered for CIE/IA.

(iv) Record Evaluation (10 Marks)

Every experiment shall be given marks, in the scale of 10, after its conduction based on student's performance and quality of write-up. Average of them, by rounding-off any fractional part thereof to next higher integer, shall be considered for CIE/IA.

Semester End-exam Evaluation (SEE) Scheme

Sl. No.	Scheme	Max. Marks
1	Short questions on Unit-1 (only write-up)	05
2	Writing steps /Algorithm/Procedure (20% weightage) and program (80% weightage) for two questions from the graded exercises	20
3	Execution/Implementation of either one of the programs written given in 2	15
4	Open-ended problem: Writing program and its execution/implementation.	05
5	Viva-voce	05
TOTAL		50
Note:		
1. Candidate is expected to submit record for the examination.		
2. Student shall be allowed to execute the program even if she/he is unable to write the procedure/steps/algorithm.		
3. Open-ended problem is of the nature and magnitude similar to graded exercises in Unit-2, and it can be assigned by the examiner. Further, open-end programs executed in 11 of Unit-2 shall be excluded. Idea behind open-end program is to assess the ability of a student to write any program.		

Model Questions for Practice and Semester End Examination

Graded Exercises

1. Write a C program that computes resistance of any resistor given its colour codes Red-Yellow-Blue and tolerance code Gold.
2. Write a C program to generate result-class of a set of students given their individual total marks

Sl No	Reg. No.	Name of the student	Marks obtained out of 600	Result
1		ABC	456	?
2		ABD	232	?
3		XYZ	345	?
4		MNO	577	?
5		PXY	365	?

3. Write a C program to count number of vowels in any given word
4. Write a C program to multiply two matrices
5. Write a C program to add two 3x4 matrices
6. Write a C program to reverse a given word

7. Write a C program to compute $\sin(x)$ given x in radians using series method; relevant library functions can be used
8. Write a C program containing a structure to represent book; create five such books and compute the sum of the costs of all the books
9. Write a C program to simulate an arithmetic calculator that can perform addition, subtraction, multiplication and division
10. Write a C program to sort an array of N numbers using a user-defined function

End

3ನೇ ಸೆಮಿಸ್ಟರ್ ಕನ್ನಡ-1 (ಕನ್ನಡೇತರರಿಗೆ ಕನ್ನಡ ಪರಿಚಯ)

3rd Semester	Course: Kannada Kali-1	Course Code: 15KA3NT (2016-17)
	No. of Credits: 02	No. of teaching hours/week: 02 No. of teaching hours/Semester:26
	Mode of Assessment and Evaluation: Continuous Internal Evaluation (CIE) only. I.A Tests:30 Marks (3 Tests) Student activities: 20 Marks	Maximum Marks: 50 (CIE only) Minimum Passing marks: 20 (IA Tests + Student activities)

ಉದ್ದೇಶ:

1. ಕೇಳುವುದು, ಗ್ರಹಿಸುವುದು, ನಿರರ್ಗಳವಾಗಿ ಮತ್ತು ಸ್ಪಷ್ಟವಾಗಿ ಓದುವ ಮತ್ತು ಮಾತನಾಡುವ (ಅಭಿವ್ಯಕ್ತಿಸುವ) ಸಾಮರ್ಥ್ಯವನ್ನು ಬೆಳೆಸುವುದು.
2. ಜ್ಞಾನಾರ್ಜನೆ, ಸಾಹಿತ್ಯಾಭಿರುಚಿ, ಚಿಂತನೆ ಮತ್ತು ಆನಂದಕ್ಕಾಗಿ ಸ್ವತಂತ್ರವಾಗಿ ಓದಲು, ಬರೆಯಲು ಮತ್ತು ಮಾತನಾಡಲು ಸಮರ್ಥರಾಗುವಂತೆ ಮಾಡುವುದು.
3. ಪದ ಸಂಪತ್ತನ್ನು ಹೆಚ್ಚಿಸಿಕೊಂಡು ಸ್ಪಷ್ಟ ಉಚ್ಚಾರಣೆಯೊಡನೆ ಲಿಖಿತ ಮತ್ತು ಮೌಖಿಕ ಚಟುವಟಿಕೆಗಳನ್ನು ಮಾಡಿಸಿ, ಸ್ವತಂತ್ರವಾಗಿ ಭಾಷೆಯ ಬಳಕೆ ಮಾಡುವುದು.
4. ನಾಡು-ನುಡಿ, ಸಂಸ್ಕೃತಿ ಮತ್ತು ಸಾಹಿತ್ಯಗಳ ಪರಿಚಯ ಮತ್ತು ಆತ್ಮೀಯ ಭಾವಾಭಿಮಾನವನ್ನು ಬೆಳೆಸುವುದು.
5. ಕ್ರಿಯಾತ್ಮಕ ಚಟುವಟಿಕೆಗಳಿಂದ ಭಾಷಾ ಕೌಶಲ್ಯದ ಸರಳ ಪ್ರಯೋಗ ಮಾಡಿಸುವುದು./ಕಲಿಸುವುದು.
(ಕ್ರಿಯಾತ್ಮಕ ಚಟುವಟಿಕೆ ಎಂದರೆ, ವರ್ಣಮಾಲೆ ಪರಿಚಯ, ವ್ಯಾಕರಣದ ಸರಳ ಪರಿಚಯ, ಗುಣಿತಾಕ್ಷರ, ಸಂಯುಕ್ತಾಕ್ಷರಗಳು, ನಾಮಪದ, ಲಿಂಗ, ವಚನ, ಪ್ರತ್ಯಯಗಳು, ವಾಕ್ಯರಚನೆ (ಕತ್ಯ, ಕರ್ಮ, ಕ್ರಿಯಾಪದ) ಇತ್ಯಾದಿ)

ಪಠ್ಯಕ್ರಮ ಮತ್ತು ಸರಳ ಭಾಷಾ ಕೌಶಲ್ಯ

(ಕನ್ನಡ ಕಲಿ-ಪಠ್ಯಪುಸ್ತಕ -ಶ್ರೀ ಲಿಂಗದೇವರು ಹಳೇಮನೆ - ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಹಂಪಿ ಪ್ರಕಾಶನ)

ಭಾಗ-1

ಪಾಠಗಳ ಕ್ರಮಾಂಕ Lesson No	ಪಠ್ಯವಸ್ತುವಿನ ವಿವರ - Curriculum Content	ಸೆಮಿಸ್ಟರ್ ಬೋಧನ ಆವಧಿ Total no.of Classes /Sem
	ಕನ್ನಡ ಭಾಷೆಯ ಪರಿಚಯ/ವರ್ಣಮಾಲೆ/ಕನ್ನಡ ಕಲಿ'ಯುವ ವಿಧಾನ ಕುರಿತ ಮಾಹಿತಿ	02
1	Introducing each other Personal Pronouns, Possessive forms and Interrogative words 1. ನಾವು ಮತ್ತು ಭಾಷೆ 2. ಅಕ್ಷರಗಳಿಂದ ಪದಗಳು	03
2	Introducing each other Personal Pronouns, Possessive forms - Yes/No Type Interrogative	02
3	About Ramayana. Possessive forms of nouns, dubitive question, Relative nouns. ಪದಗಳಿಂದ ವಾಕ್ಯಗಳು	02
4	Enquiring about college. Qualitative and quantitative adjectives.	02
5	Enquiring about room. Predicative forms,	02

	locative case.	
6	Vegetable Market. Dative case, basic numerals.	02
7	About Medical college. Ordinal numerals, plural markers.	02
8	In a cloth shop. Color adjectives, defective verbs	02
9	Plan to go for picnic - imperative, permissive and hortative	02
10	Enquiring about one's family, Verb iru, and corresponding negation ಕನ್ನಡ ಚಿತ್ರಪಟಗಳಲ್ಲಿನ ಅಕ್ಷರಗಳನ್ನು ಗುರುತಿಸಿ ಓದಿ ದಿನಪತ್ರಿಕೆ ಓದುವ ಹವ್ಯಾಸ--ಸಂವಹನ ಮಾಧ್ಯಮದ ಬಗ್ಗೆ ಪರಿಚಯ ಆಂತರಿಕ ಮೌಲ್ಯಮಾಪನ ಪರೀಕ್ಷೆಗಳು	02
	ಒಟ್ಟು ಗಂಟೆಗಳು	26

ಸೂಚನೆಗಳು:

- ಈ ಪಠ್ಯದ ಮೂಲ ಉದ್ದೇಶ ಕನ್ನಡೇತರ ವಿದ್ಯಾರ್ಥಿಗಳು ಸರಳ ಕನ್ನಡ ಭಾಷೆಯಲ್ಲಿ ವ್ಯವಹರಿಸುವಂತೆ ಮಾಡುವುದಾಗಿದೆ. “ಕನ್ನಡ ಕಲಿ” ಪುಸ್ತಕದ ಮೇಲಿನ ಪಾಠಗಳ ಜೊತೆಗೆ “ಕ್ರಿಯಾತ್ಮಕ ಚಟುವಟಿಕೆ”ಯಿಂದ ಗಳಿಸುವ ಅಕ್ಷರ ಜ್ಞಾನದಿಂದ ಪದ ಸಂಪತ್ತು ಹೆಚ್ಚಿಸಿ, ಪದಗಳಿಂದ ಸ್ವಂತ ವಾಕ್ಯಗಳ ರಚನೆ ಮಾಡಿಸುವುದು. (ಅಮ್ಮ, ಮೊಬೈಲ್, ಕನ್ನಡ ಭಾಷೆ, ಕವಿಗಳು, ನಾಟಕ, ಜನಪದ ಕಲೆ, ನಾಡಿನ ಪ್ರಸಿದ್ಧ ವ್ಯಕ್ತಿಗಳು, ಸಹೋದರ, ಸ್ನೇಹಿತ, ತರಕಾರಿ, ದೋಸೆ, ತಿಂಡಿ, ನಿದ್ರೆ, ಬಿಸಿ, ಚಳಿ, ಆಕಾಶ, ಓದು, ಇತ್ಯಾದಿ ನಿತ್ಯ ಬಳಕೆಯ ಸರಳ ಪದಗಳಿಂದ ವಾಕ್ಯರಚನೆ ಮತ್ತು 25-50 ಪದಗಳ ಕಿರು ಲೇಖನ ರಚನೆ).
- ತರಗತಿ ಚಟುವಟಿಕೆಗಳ ಪುಸ್ತಕದಲ್ಲಿ (ಕ್ಲಾಸ್ ಅಸೈನ್‌ಮೆಂಟ್) ಕನ್ನಡ ವರ್ಣಮಾಲೆಯ ಸ್ವರ, ವ್ಯಂಜನಗಳ ಅಕ್ಷರಗಳ ಬರವಣಿಗೆ ಅಭ್ಯಾಸ, ವ್ಯಂಜನಗಳಿಗೆ ಸ್ವರಗಳನ್ನು ಸೇರಿಸುವಿಕೆ, ಅಕ್ಷರಗಳಿಂದ ಪದರಚನೆ, ಪದಗಳಿಗೆ ಪ್ರತ್ಯಯಗಳನ್ನು ಸೇರಿಸುವುದು (ಗೆ, ಯಿಂದ, ಅನ್ನು, ಅಲ್ಲಿ, ಗಳು, ಎಂದು.....ಇತ್ಯಾದಿ ಪಠ್ಯದಲ್ಲಿ ಬರುವ ಪದಗಳಿಗೆ ನಿತ್ಯ ಬಳಕೆಯ ಪ್ರತ್ಯಯಗಳನ್ನು ಸೇರಿಸುವುದು) ಪದಗಳಿಂದ ವಾಕ್ಯ ರಚನೆ ಮಾಡುವುದು. ಮತ್ತು ಪಾಠ 1-10ರ ಪಠ್ಯಾಂತ್ಯದಲ್ಲಿ ಬರುವ ಅಭ್ಯಾಸಗಳಲ್ಲಿ ಆರಿಸಿದ ಅಭ್ಯಾಸ ಭಾಗಗಳನ್ನು ಬರಿಸುವುದು. ಮತ್ತು ಪಾಠ-20 ರ ಸ್ಪಿಚ್- ಅನ್ನು ಆಧಾರವಾಗಿಟ್ಟುಕೊಂಡು ಅಭ್ಯಾಸ ಮಾಡಿಸುವುದು.

ಆಕರ ಗ್ರಂಥಗಳು:

1. ಕನ್ನಡ ಕಲಿ-ಶ್ರೀ ಲಿಂಗದೇವರು ಹಳೇಮನೆ - ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಹಂಪಿ.
2. ಪ್ರಾಥಮಿಕ ಶಾಲೆಯ ಕನ್ನಡ ಪಠ್ಯಪುಸ್ತಕಗಳು
3. ಸರಳ ಕನ್ನಡ ವ್ಯಾಕರಣ ಪುಸ್ತಕಗಳು- ಎಂ.ವಿ ನಾಗರಾಜರಾವ್/ಇತರೆ ಲೇಖಕರು.
4. ಪ್ರಯೋಗ ಪ್ರಣತಿ-ಪ್ರಥಮ ಪಿಯುಸಿ ಪೂರಕ ಪಠ್ಯ.
5. ಸರಳ ಪತ್ರವ್ಯವಹಾರದ ಪುಸ್ತಕಗಳು

ಪರೀಕ್ಷೆ ಮತ್ತು ಮೌಲ್ಯಮಾಪನ ವಿಧಾನ (3ನೇ ಸೆಮಿಸ್ಟರ್)

ನಿರಂತರ ಅಂತರಿಕ ಮೌಲ್ಯಮಾಪನ- Continuous Internal Evaluation (CIE) only.

ಕ್ರ.ಸಂ.	ಚಟುವಟಿಕೆಗಳು	ವಿವರ	ಗರಿಷ್ಠಾಂಕ	ಉತ್ತೀರ್ಣತೆಗೆ ಕನಿಷ್ಠಾಂಕ
01	ಆಂತರಿಕ ಮೌಲ್ಯಮಾಪನ (I A Tests)	ಮೂರು ಆಂತರಿಕ ಮೌಲ್ಯಮಾಪನ ಪರೀಕ್ಷೆಗಳು (ಸರಾಸರಿ ಅಂಕಗಳನ್ನು ಪರಿಗಣಿಸುವುದು)	30	
02	ಕನ್ನಡ ಭಾಷಾ ಕೌಶಲ್ಯಾಭಿವೃದ್ಧಿ ಚಟುವಟಿಕೆಗಳು (Student Activities)	ಮೂರು ಚಟುವಟಿಕೆಗಳು (ಸರಾಸರಿ ಅಂಕಗಳನ್ನು ಪರಿಗಣಿಸುವುದು)	20	
		ಒಟ್ಟು ಅಂಕಗಳು	50	20

Course outcome:

1. Developing listening and speaking skills.
2. Easy Interaction with peers.
3. Students can use the language at ease in daily life situations

ಆಂತರಿಕ ಮೌಲ್ಯಮಾಪನ ಪರೀಕ್ಷೆಗಳ ಮಾದರಿ ಪ್ರಶ್ನೆಪತ್ರಿಕೆಗಳು:

ನಿರಂತರ ಆಂತರಿಕ ಮೌಲ್ಯಮಾಪನ ಪರೀಕ್ಷೆಗಳಿಗೆ ಈ ಕೆಳಗಿನ ಮಾದರಿಯಲ್ಲಿ ಪ್ರಶ್ನೆಪತ್ರಿಕೆಯನ್ನು ಸಿದ್ಧಪಡಿಸಿ ನಡೆಸುವುದು ಮತ್ತು “ಕನ್ನಡ ಕಲಿ” ಪಠ್ಯದ ಕಲಿಕೆ ವಿವರಣೆ (ಭಾಷಾಭ್ಯಾಸ) ಸಂಭಾಷಣಾ ಭಾಗಗಳು ಮತ್ತು ಅಂತ್ಯದಲ್ಲಿ ಅಭ್ಯಾಸ ಪುಸ್ತಕದಲ್ಲಿ ಬರುವ ಪ್ರಶ್ನೆಗಳ ವಿಧಾನವನ್ನು ಪರ್ಯಾಯವಾಗಿ ಬಳಸಿಕೊಂಡು ಪ್ರಶ್ನೆಪತ್ರಿಕೆಗಳನ್ನು ತಯಾರಿಸಿಕೊಳ್ಳಬಹುದು.

ಡಿಪ್ಲೋಮಾ 3ನೇ ಸೆಮಿಸ್ಟರ್ - ಕನ್ನಡ ಕಲಿ-1 (ಕನ್ನಡೇತರರಿಗೆ ಕನ್ನಡ ಪರಿಚಯ)

ಆಂತರಿಕ ಮೌಲ್ಯಮಾಪನ ಪರೀಕ್ಷೆ

ಸಮಯ: 60 ನಿಮಿಷಗಳು

ಅಂಕ: 30

-
- I. Fill in the blanks using the appropriate words.(Any FOUR) 1X4=04
- i) nimma raajya.....?
 - ii) adu.....pustaka?
 - iii) avana hesaru suratkal injiniyaring kaaleju.
 - iv) ondu ruupaayige.....paise.
 - v) aval.ige hindustaani sanita tumba.....
 - vi) nanage ninna sahavaasa khanDitaa.....
 - vii) avanu nimma ?
- II. Use the following words (any FOUR) in your own sentences. 1X4=04
1.adhyaapaki 2.snehita 3. Vyaapaara 4.keTTa 5. Hasiru 6.angadi 7.taaja
- III. Answer the following questions (any FOUR) 1X4=04
- (a) nimma uuru yaavudu?
 - (b) nivu diploma vidyaarthinaa?
 - (c) nimma pennige estu ruupaaye?
 - (d) nimma maatrubaahashe yaavudu?
 - (e) nimage tingalige eshtu ruupaayi beeku?
 - (f) nimma mane/ruumu elli ide?
- IV. Translate the following sentence in Kannada. (any FOUR) 4X2=08
1. Kannada is the language of Karnataka.
 2. My book is in my house.
 3. We have two houses in Bangalore.
 4. How much is this Pumpkin weighs?
 5. I want two packets of biscuits.
 6. How much do you pay rent for your room?
 7. What else do you want?

V. ಕೆಳಗಿನವುಗಳನ್ನು ಹೊಂದಿಸಿ ಬರೆಯಿರಿ. (Match the following) 1X4=04

1. ನೀವು ಯಾವಾಗ ಮನೆಯಲ್ಲಿ	1.ಇದೆ
2. ಪುಸ್ತಕ ಮೇಜಿನ ಮೇಲೆ	2.eldest son
3. Jaaga-ಜಾಗ	3.ಇರ್ತೀರಿ
4. Hiri maga	4.space

VI. (1) Change into interragative using the underlined word. (Any Three) 1X3=03

1. Ivattu guruvaara.
2. evattu hattanee taariku
3. Aval hesaru liila.
4. Avara maatrabhaashe telagu alla.
5. Vavige ipptaydu ruupaayei beeku.
6. Adu maalatiya mane.

(2) change into Interrogate. (Any THREE) 1X3=03

- 1.ಹೌದು, ಇದು ಪುಸ್ತಕ.
2. ಆಗಲಿ, ಹೋಗೋಣ.
3. ಈಗ ಒಂದೂವರೆ ಗಂಟೆ.
4. ಅವರು ಮನೆಗೆ ಬರುತ್ತಾರೆ.
5. ನಾವಿ ಮನೆಗೆ ಹೋಗೋಣ.
6. ಅವರು ಮನೆಗೆ ಹೋಗಲಿ.

ಕನ್ನಡ ಪಠ್ಯಕ್ರಮ ರಚನಾ ಸಮಿತಿ

• ಸಂಪಾದಕೀಯ ಸಮಿತಿ:

1. ಶ್ರೀ ಟಿ ಎಲ್ ರವೀಂದ್ರ, ಉಪನ್ಯಾಸಕರು, ಸರ್ಕಾರಿ ಜಿ.ಆರ್.ಐ.ಸಿ.ಪಿ ಬೆಂಗಳೂರು.
2. ಶ್ರೀ ಟಿ. ತಿಮ್ಮಪ್ಪ, ಉಪನ್ಯಾಸಕರು(ಆಯ್ಕೆ ಶ್ರೇಣಿ), ಯಾಂತ್ರಿಕ ವಿಭಾಗ, ಸರ್ಕಾರಿ ಪಾಲಿಟೆಕ್ನಿಕ್, ತುಮಕೂರು.

• ಸಲಹಾ ಸಮಿತಿಯ ಬಾಹ್ಯ ಸಂಪನ್ಮೂಲ ವ್ಯಕ್ತಿಗಳು.

1. ಪ್ರೊ. (ಡಾ.) ಡಿ. ಪಾಂಡುರಂಗ ಬಾಬು, ಕುಲಸಚಿವರು, ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಹಂಪಿ.
2. ಪ್ರೊ. (ಡಾ.) ಅಶೋಕ್ ಕುಮಾರ್ ರಂಜರೆ, ಪ್ರಾಧ್ಯಾಪಕರು, ಪ್ರಸಾರಾಂಗ ವಿಭಾಗ, ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಹಂಪಿ.
3. ಪ್ರೊ. (ಡಾ.) ಕೆ ವೈ ನಾರಾಯಣ ಸ್ವಾಮಿ, ಸಹ ಪ್ರಾಧ್ಯಾಪಕರು, ಸ್ನಾತಕೋತ್ತರ ವಿಭಾಗ, ಸರ್ಕಾರಿ ಕಲಾ ಕಾಲೇಜು, ಬೆಂಗಳೂರು.
4. ಪ್ರೊ. (ಡಾ.) ಜೆ ಬಾಲಕೃಷ್ಣ, ಪ್ರಾಧ್ಯಾಪಕರು ಹಾಗೂ ಮುಖ್ಯಸ್ಥರು, ಕನ್ನಡ ಭಾಷಾ ಅಧ್ಯಯನ ವಿಭಾಗ, ಕೃಷಿ ವಿಶ್ವವಿದ್ಯಾಲಯ, (ಜಿಕೆವಿಕೆ) ಹೆಬ್ಬಾಳ, ಬೆಂಗಳೂರು.

KARNATAKA STATE BOARD OF TECHNICAL EXAMINATION, BENGALURU.															
TEACHING AND EXAMINATION SCHEME FOR KANNADA COURSE IN DIPLOMA PROGRAMME															
SEMESTER: III											COMMON TO ALL DIPLOMA PROGRAMMES			C-15 Curriculum	
SL.NO	COURSE NAME	Teaching Department	COURSE /QP CODE	Teaching scheme					Examination scheme						
				Contact hours					Exam paper duration in Hrs	End exam		Maximum CIE Marks (IA+SA)	Minimum Marks for passing. (IA + SA)		
TH	TU	PR	TOTAL	Credit	Max marks	Min marks									
	THEORY														
1	KANNADA KALI-1	KA	15KA3NT	2	-	-	2	2	-	-	-	50	20		
2	TANTRIKA KANNADA -1	KA	15KA3KT	2	-	-	2	2	-	-	-	50	20		

CIE- Continuous Internal Examination: SEE-Semester End Examination: IA-Internal Assessment Tests: SA- Student Activity.

- Note: 1. Candidates studied Kannada as one subject in 10th standard shall take Tantrika Kannada 1 & 2. Others may take "Kannada Kali-1&2".
2. In 3rd Semester- Assessment is only by CIE and no SEE. Average marks of three IA tests shall be rounded off to the next higher digit. Rubrics to be devised appropriately to assess student activity.

KARNATAKA STATE BOARD OF TECHNICAL EXAMINATION, BENGALURU.															
TEACHING AND EXAMINATION SCHEME FOR KANNADA COURSE IN DIPLOMA PROGRAMME															
SEMESTER: IV											COMMON TO ALL DIPLOMA PROGRAMMES			C-15 Curriculum	
SL.NO	COURSE NAME	Teaching Department	COURSE /QP CODE	Teaching scheme					Examination scheme						
				Contact hours					Exam paper duration in Hrs	Sem End Exam		Maximum CIE Marks (IA+SA)	Minimum Marks for passing. (IA + SA)		
TH	TU	PR	TOTAL	Credit	Max Exam Marks	Min Passing Marks									
	THEORY														
1	KANNADA KALI-2	KA	15KA4NT	2	-	-	2	2	2	50	20	-	-		
2	TANTRIKA KANNADA -2	KA	15KA4KT	2	-	-	2	2	2	50	20	-	-		

CIE- Continuous Internal Examination: SEE-Semester End Examination: IA-Internal Assessment Tests: SA- Student Activity.

- Note: In 4th Semester- Assessment is only by SEE and no CIE. To award diploma certificate, passing in Kannada course is mandatory. However Kannada course is not included in the eligibility criteria for promotion to the higher semester.

ಡಿಪ್ಲೋಮಾ-ತಾಂತ್ರಿಕ ಕನ್ನಡ-1 (ಕನ್ನಡ ಬಲ್ಲವರಿಗಾಗಿ)
3ನೇ ಸೆಮಿಸ್ಟರ್ - ತಾಂತ್ರಿಕ ಕನ್ನಡ -1 (ಸಾಹಿತ್ಯ ಮತ್ತು ಭಾಷಾ ಕೌಶಲ್ಯ ಪ್ರಯೋಗ)
ಪಠ್ಯಕ್ರಮ

3rd Semester	Course: ತಾಂತ್ರಿಕ ಕನ್ನಡ -1	Course Code: 15KA3KT (2016-17)
	No. of Credits: 02	No. of teaching hours/week: 02 No. of teaching hours/Semester:26
	Mode of Assessment and Evaluation: Continuous Internal Evaluation (CIE) only. I.A Tests:30 Marks (3 Tests) Student activities: 20 Marks	Maximum Marks: 50 (CIE only) Minimum Passing marks: 20 (IA Tests + Student activities)

ಪಠ್ಯ ಪ್ರಕಾರ	ಪಾಠ	ಪಠ್ಯದ ಹೆಸರು/ಲೇಖಕರು/ಪ್ರಕಟಣೆ	ಸೆಮಿಸ್ಟರ್ ಬೋಧನಾವಧಿ ಗಂಟೆಗಳು
ಇತಿಹಾಸ	1	'ಸಂಸ್ಕೃತಿ'- ದೇ.ಜೆ.ಗೌ (ನಾಟ್ಯ ಸಂಸ್ಕೃತಿ-ದೇ.ಜೆ.ಗೌ)	02
ಸಂಸ್ಕೃತಿ	2	ನಮಗೆ ಬೇಕಾಗಿರುವ ಇಂಗ್ಲಿಷ್- ಕುವೆಂಪು	02
ಪರಿಸರ	3	ಆನೆ ಹಳ್ಳದಲ್ಲಿ ಹುಡುಗಿಯರು - ಬಿ ಜಿ ಎಲ್ ಸ್ವಾಮಿ	02
ಕ್ರೀಡೆ/ಜೀವನಕಲೆ	4	ಸೋಲಂಬುದು ಅಲ್ಪವಿರಾಮ - ನೇಮಿಚಂದ್ರ	02
ಯಶೋಗಾಥೆ/ವ್ಯಕ್ತಿಚಿತ್ರಣ	5	ಬದುಕನ್ನು ಪ್ರೀತಿಸಿದೆ ಸಂತ - ಎಚ್.ಆರ್.ರಾಮಕೃಷ್ಣ (ಕಲಾಂರ ವ್ಯಕ್ತಿ ಚಿತ್ರ)	02
ತಂತ್ರಜ್ಞಾನ	6	ಮಂಗಳನ ಅಂಗಳದಲ್ಲಿ - ಜಿ.ಬಾಲಕೃಷ್ಣ	02
ಭಾಷಾ ಕೌಶಲ್ಯ ಚಟುವಟಿಕೆಗಳು	7	*ಮೌಖಿಕ ಅಭಿವ್ಯಕ್ತಿ: ಸಹಜ ಭಾಷಾ ಬಳಕೆ: .ಆಶು ಭಾಷಣ> ವಿವಿಧ ರಚನಾತ್ಮಕ/ದೈನಂದಿನ ಬಳಕೆ ವಸ್ತು, ವ್ಯಕ್ತಿ, ಭಾವನೆಗಳ ಮೇಲೆ. ಒಂದು ಸಣ್ಣ ಏಕಾಂಕ (5-10 ನಿಮಿಷ) ನಾಟಕ. ಮಾದರಿ ಸಂದರ್ಶನ (ನೇಮಕಾತಿಗಾಗಿ ಸಂದರ್ಶನ)	06
ಲಿಖಿತ ಚಟುವಟಿಕೆಗಳು	8	ವಿಸ್ತರಣೆ: ನುಡಿಗಟ್ಟುಗಳು-ಪದಗಳನ್ನು ಬಳಸಿಕೊಂಡು ಸಣ್ಣ ವಾಕ್ಯಗಳ ರಚನೆ ಪರ್ಯಾಯ ಪದಗಳನ್ನು ಬರೆಯುವುದು(ಉದಾ: ಬಳಸು=ಉಪಯೋಗಿಸು, ಕಾಯು= ನಿರೀಕ್ಷಿಸು, ಚಿಂತಿಸು=ಯೋಚಿಸು, ಕೂಡಿಸುವಿಕೆ=ಸೇರಿಸುವಿಕೆ.....ಇತ್ಯಾದಿ)	06
		ಆಂತರಿಕ ಮೌಲ್ಯಮಾಪನ ಪರೀಕ್ಷೆಗಳು	02
		ಒಟ್ಟು ಗಂಟೆಗಳು	26

ತಾಂತ್ರಿಕ ಕನ್ನಡ-1

3ನೇ ಸೆಮಿಸ್ಟರ್ ಡಿಪ್ಲೋಮಾದ ಕನ್ನಡ ಪಠ್ಯ (ಕನ್ನಡ ಬಲ್ಲವರಿಗಾಗಿ)

1. ಪಠ್ಯರಚನಾ ಸಮಿತಿ
2. ನಿರ್ದೇಶಕರ ಮುನ್ನುಡಿ
3. ಪಠ್ಯ ರಚನಾ ಸಮಿತಿ ಮಾತುಗಳು
4. ಪಠ್ಯಕ್ರಮ

ಪರಿವಿಡಿ

ಗದ್ಯ ವಿಹಾರ

1. ನಾಟ್ಯ ಸಂಸ್ಕೃತಿ (ಇತಿಹಾಸ) - ದೆ.ಜೆ.ಗೌ
2. ನಮಗೆ ಬೇಕಾಗಿರುವ ಇಂಗ್ಲಿಷ್ (ಸಂಸ್ಕೃತಿ) - ಕುವೆಂಪು
3. ಸೋಲೆಂಬುದು ಅಲ್ಪವಿರಾಮ (ಕ್ರೀಡೆ/ಜೀವನಕಲೆ) - ನೇಮಿಚಂದ್ರ
4. ಆನೆ ಹಳ್ಳದಲ್ಲಿ ಹುಡುಗಿಯರು (ಪರಿಸರ) - ಬಿ.ಜಿ.ಎಲ್.ಸ್ವಾಮಿ
5. ಬದುಕನ್ನು ಪ್ರೀತಿಸಿದ ಸಂತ (ಯಶೋಗಾಥೆ/ವ್ಯಕ್ತಿಚಿತ್ರಣ) - ಎಚ್.ಆರ್.ರಾಮಕೃಷ್ಣ
6. ಮಂಗಳನ ಅಂಗಳದಲ್ಲಿ..... - ಡಾ:ಜೆ.ಬಾಲಕೃಷ್ಣ

ಭಾಷಾ ಕೌಶಲ್ಯ-ಚಟುವಟಿಕೆಗಳು

7. ಮೌಖಿಕ ಅಭಿವ್ಯಕ್ತಿ ಚಟುವಟಿಕೆಗಳು
8. ಲಿಖಿತ ಅಭಿವ್ಯಕ್ತಿ ಚಟುವಟಿಕೆಗಳು

Course outcome:

1. Developing listening and speaking skills.
2. Easy Interaction with peers.
3. Students can use the language at ease in daily life situations

ಪರೀಕ್ಷೆ ಮತ್ತು ಮೌಲ್ಯಮಾಪನ ವಿಧಾನ (3ನೇ ಸೆಮಿಸ್ಟರ್)

ನಿರಂತರ ಅಂತರಿಕ ಮೌಲ್ಯಮಾಪನ- Continuous Internal Evaluation (CIE) only.

ಕ್ರ.ಸಂ.	ಚಟುವಟಿಕೆಗಳು	ವಿವರ	ಗರಿಷ್ಠಾಂಕ	ಉತ್ತೀರ್ಣತೆಗೆ ಕನಿಷ್ಠಾಂಕ
01	ಆಂತರಿಕ ಮೌಲ್ಯಮಾಪನ (IA Tests)	ಮೂರು ಆಂತರಿಕ ಮೌಲ್ಯಮಾಪನ ಪರೀಕ್ಷೆಗಳು (ಸರಾಸರಿ ಅಂಕಗಳನ್ನು ಪರಿಗಣಿಸುವುದು)	30	
02	ಕನ್ನಡ ಭಾಷಾ ಕೌಶಲ್ಯಾಭಿವೃದ್ಧಿ ಚಟುವಟಿಕೆಗಳು (Student Activities)	ಮೂರು ಚಟುವಟಿಕೆಗಳು (ತಾಂತ್ರಿಕ ಪ್ರಬಂಧ/ಅಶುಭಾಷಣ/ಚರ್ಚೆ/ತಾಂತ್ರಿಕ ಕ್ಷೇತ್ರಗಳಲ್ಲಿನ ಅವಿಷ್ಕಾರಗಳ ಬಗ್ಗೆ ವಿಶ್ಲೇಷಣೆ ಇತ್ಯಾದಿ.) (ಸರಾಸರಿ ಅಂಕಗಳನ್ನು ಪರಿಗಣಿಸುವುದು)	20	
ಒಟ್ಟು ಅಂಕಗಳು			50	20

ಸೂಚನೆ:

ಭಾಷಾ ಚಟುವಟಿಕೆಗಳಿಗಾಗಿ ತರಗತಿ ಚಟುವಟಿಕೆಗಳ ಪುಸ್ತಕದಲ್ಲಿ (ತರಗತಿಯ ಪ್ರಗತಿಪರ ಮೌಲ್ಯಮಾಪನ). ಗಾದೆಗಳ ವಿಸ್ತರಣೆ, ನುಡಿಗಟ್ಟುಗಳು, ಸಂಭಾಷಣೆ ಮಾದರಿಗಳು ಮತ್ತು ಪಠ್ಯದ ಸಾಹಿತ್ಯ ಭಾಗದ ಪಾಠಗಳ ಮೇಲೆ ಪ್ರಶ್ನೆಗಳಿಗೆ ಉತ್ತರ-ಟಿಪ್ಪಣಿ ಮತ್ತು ಶಬ್ದಾರ್ಥದಲ್ಲಿ ಬರುವ ಪದಗಳಿಂದ ವಾಕ್ಯ ರಚನೆ ಮಾಡಿಸುವುದು.

• ಮಾದರಿ ಪ್ರಶ್ನೆಪತ್ರಿಕೆ

3ನೇ ಸೆಮಿಸ್ಟರ್- ತಾಂತ್ರಿಕ ಕನ್ನಡ-1 (ಕನ್ನಡಬಲ್ಲ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ)

ಸಮಯ: 1.00 ಗಂಟೆ

ಅಂಕಗಳು:30

ಸೂಚನೆ: ಕೆಳಗಿನ ಪ್ರಶ್ನೆಗಳಿಗೆ ಸೂಚನೆಗಳ ಪ್ರಕಾರ ವ್ಯಾಕರಣದೋಷವಿಲ್ಲದಂತೆ ಉತ್ತರಿಸಿ.

1. ಈ ಕೆಳಗಿನ 04 ಪ್ರಶ್ನೆಗಳಿಗೆ ಒಂದು ಪೂರ್ಣ ವಾಕ್ಯದಲ್ಲಿ ಉತ್ತರಿಸಿ. 1*4=04
 - (ಅ) ನಾಟ್ಯ ಯಾವಾಗ ಹುಟ್ಟಿಕೊಂಡಿತು?
 - (ಆ) ಆನೆ ಹಳ್ಳದ ಕಾಡಿನಲ್ಲಿ ನಾಪತ್ತೆಯಾದ ಹುಡುಗಿಯರ ಹೆಸರುಗಳನ್ನು ತಿಳಿಸಿ.
 - (ಇ) ರಾಷ್ಟ್ರಪತಿಯಾಗಿ ಆಯ್ಕೆಯಾದಾಗ ಕಲಾಂ ಅವರು ಮೊದಲು ಹೇಳಿದ ಮಾತುಗಳೇನು?
 - (ಈ) ಮಂಗಳನ ಅಂಗಳ ತಲುಪಿದ ಮೊದಲ ಅಂತರಿಕ್ಷ ನೌಕೆ ಯಾವುದು?
 - (ಉ) 'ಹಗಲುಗನಸು' ನುಡಿಗಟ್ಟನ್ನು ಬಳಸಿ ಸ್ವಂತ ವಾಕ್ಯವನ್ನು ರಚಿಸಿ.
 - (ಊ) 'ಸಿಹಿಕಹಿ' ಜೋಡುಪದವನ್ನು ಒಂದು ವಾಕ್ಯದಲ್ಲಿ ಬಳಸಿ.
2. ಕೆಳಗಿನ ಯಾವುದೇ ನಾಲ್ಕು ಪ್ರಶ್ನೆಗಳಿಗೆ ಕನಿಷ್ಠ ಐದಾರು ವಾಕ್ಯಗಳಲ್ಲಿ ಉತ್ತರಿಸಿ. 4*4=16
 - (1) ಕುವೆಂಪು ಅವರು ಇಂಗ್ಲಿಷ್ ಕಲಿಯುವವರನ್ನು ಎಷ್ಟು ವಿಭಾಗವಾಗಿ ಹೇಗೆ ವಿಂಗಡಿಸಿದ್ದಾರೆ?
 - (2) ಕಲಾಂ ಅವರ ಯಶಸ್ಸಿನ ಮಂತ್ರಗಳೇನು?
 - (3) ಗಾದೆಗಳ ಮಹತ್ವವೇನು? ನಿಮಗೆ ಗೊತ್ತಿರುವ ಯಾವುದೇ ಎರಡು ಗಾದೆಗಳನ್ನು ಹೆಸರಿಸಿ.
 - (4) ಸಂವಹನ ಸಂದರ್ಭದಲ್ಲಿ ಬಳಸುವ ಭಾಷೆ ಹೇಗಿರಬೇಕು?
 - (5) ನೇಮಿಚಂದ್ರರ 'ಸಾವಿನತ್ತ ಒಂದು ಹೆಜ್ಜೆ' ಕತೆ ಓದಿದ ಹುಡುಗಿ ತನ್ನ ಸೋಲಿನಿಂದ ಹೊರಗೆ ಬಂದದ್ದು ಹೇಗೆ?
 - (6) ಸಂದರ್ಶನ ಎಂದರೇನು? ವಿವರಿಸಿ.
3. ಯಾವುದೇ ಎರಡು ಪ್ರಶ್ನೆಗಳಿಗೆ ಉತ್ತರಿಸಿ. 2*5=10
 - (1) ನಾಟ್ಯಕಲೆಯಲ್ಲಿ ಯಕ್ಷಗಾನ ಕಲೆ ಪ್ರಮುಖವಾದುದು. ಇದರ ಹುಟ್ಟು ಮತ್ತು ವ್ಯಾಪ್ತಿ ಬಗ್ಗೆ ತಿಳಿಸಿ.
 - (2) ಮಂಗಳಯಾನದ ಮುಖ್ಯ ಉದ್ದೇಶಗಳೇನು?
 - (3) 'ಮಾನವೀಯ ಮೌಲ್ಯಗಳು', ಅಂತರಜಾಲ - ಎರಡರಲ್ಲಿ ಒಂದಕ್ಕೆ ಸುಮಾರು ಒಂದು ಪುಟದಷ್ಟು ಪ್ರಬಂಧ ಬರೆಯಿರಿ.
 - (4) ಉದ್ಯೋಗದ ಸಂದರ್ಶನಕ್ಕೆ ಹೋಗುವಾಗ ಮಾಡಿಕೊಳ್ಳಬೇಕಾದ ಪೂರ್ವಸಿದ್ಧತೆಗಳೇನು?.

ಕನ್ನಡ ಪಠ್ಯಕ್ರಮ ರಚನಾ ಹಾಗೂ ಪಠ್ಯಪುಸ್ತಕ ಸಮಿತಿ


• ಸಂಪಾದಕೀಯ ಸಮಿತಿ:

1. ಶ್ರೀ ಟಿ ಎಲ್ ರವೀಂದ್ರ, ಉಪನ್ಯಾಸಕರು, ಸರ್ಕಾರಿ ಜಿ.ಆರ್.ಐ.ಸಿ.ಪಿ ಬೆಂಗಳೂರು.
2. ಶ್ರೀ ಟಿ. ತಿಮ್ಮಪ್ಪ, ಉಪನ್ಯಾಸಕರು(ಆಯ್ಕೆ ಶ್ರೇಣಿ), ಯಾಂತ್ರಿಕ ವಿಭಾಗ, ಸರ್ಕಾರಿ ಪಾಲಿಟೆಕ್ನಿಕ್, ತುಮಕೂರು.

• ಸಲಹಾ ಸಮಿತಿಯ ಬಾಹ್ಯ ಸಂಪನ್ಮೂಲ ವ್ಯಕ್ತಿಗಳು.

1. ಪ್ರೊ. (ಡಾ.) ಡಿ. ಪಾಂಡುರಂಗ ಬಾಬು, ಕುಲಸಚಿವರು, ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಹಂಪಿ.
2. ಪ್ರೊ. (ಡಾ.) ಅಶೋಕ್ ಕುಮಾರ್ ರಂಜರೆ, ಪ್ರಾಧ್ಯಾಪಕರು, ಪ್ರಸಾರಾಂಗ ವಿಭಾಗ, ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಹಂಪಿ.
3. ಪ್ರೊ. (ಡಾ.) ಕೆ ವೈ ನಾರಾಯಣ ಸ್ವಾಮಿ, ಸಹ ಪ್ರಾಧ್ಯಾಪಕರು, ಸ್ನಾತಕೋತ್ತರ ವಿಭಾಗ, ಸರ್ಕಾರಿ ಕಲಾ ಕಾಲೇಜು, ಬೆಂಗಳೂರು.
4. ಪ್ರೊ. (ಡಾ.) ಜೆ ಬಾಲಕೃಷ್ಣ, ಪ್ರಾಧ್ಯಾಪಕರು ಹಾಗೂ ಮುಖ್ಯಸ್ಥರು, ಕನ್ನಡ ಭಾಷಾ ಅಧ್ಯಯನ ವಿಭಾಗ, ಕೃಷಿ ವಿಶ್ವವಿದ್ಯಾಲಯ, (ಜಿಕೆವಿಕೆ) ಹೆಬ್ಬಾಳ, ಬೆಂಗಳೂರು.

Government of Karnataka
Department of Technical Education
Board of Technical Examinations, Bangalore

	Course Title: PROFESSIONAL ETHICS & INDIAN CONSTITUTION		
	Scheme (L:T:P) : 4:0:0	Total Contact Hours: 52	Course Code: 15EC41T
	Type of Course: Lectures, Self Study & Quiz	Credit : 04	Core/ Elective: Core
CIE- 25 Marks		SEE- 100 Marks	

Prerequisites: Enthusiasm to learn the subject

Course Objectives:

1. To create an awareness on Engineering Ethics and Human Values.
2. To instill Moral and Social Values and Loyalty.
3. Create awareness among engineers about their social responsibilities
4. Appreciate the Ethical issues
5. To Know the Human rights and concept of women empowerment
6. To know features of our constitution.

Course Outcomes:

On successful completion of the course, the students will be able to attain CO:

Course Outcome		CL	Linked PO	Teaching Hrs
CO1	Practice the moral values that ought to guide the Engineering profession.	<i>R/U</i>	5,6,7,8,10	10
CO2	Discover of the set of justified moral principles of obligation, ideals that ought to be endorsed by the engineers and apply them to concrete situations	<i>U/A</i>	5,7,8,10	09
CO3	Know the definitions of risk and safety also discover different factors that affect the perception of risk	<i>R/U</i>	5,6,7,10	05
CO4	Appreciate the Ethical issues and Know the code of ethics adopted in various professional body's and industries	<i>R/U</i>	5,6,7,10	06
CO5	Justify the need for protection of human rights and to know about concept of women empowerment	<i>R/U</i>	5,6,7,8,10	8
CO6	Know the successful functioning of democracy in India	<i>R/U</i>	5,6,7,9,10	14
Total sessions				52

Legend: R; Remember, U: Understand A: Application

COURSE-PO ATTAINMENT MATRIX

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
PROFESSIONAL ETHICS & INDIAN CONSTITUTION	-	-	-	-	3	3	3	3	2	3

Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed.

Method is to relate the level of PO with the number of hours devoted to the COs which address the given PO.
 If $\geq 40\%$ of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3
 If 25 to 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 2
 If 5 to 25% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 1
 If $< 5\%$ of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed.

COURSE CONTENT AND BLUE PRINT OF MARKS FOR SEE

Unit No	Unit Name	Hour	Questions to be set for SEE			Marks weightage	weightage (%)
			R	U	A		
1	HUMAN VALUES	10	15	15	-	30	21
2	ENGINEERING ETHICS	09	10	15	-	25	17
3	SAFETY, RESPONSIBILITIES OF ENGINEERS	05	05	-	10	15	11
4	ETHICAL ISSUES IN ENGINEERING PRACTICE	06	05	05	5	15	11
5	HUMAN RIGHTS	8		15	5	20	13
6	INDIAN CONSTITUTION	14		25	15	40	27
	Total	52	35	75	35	145	100

Legend: R; Remember, U: Understand A: Application

UNIT I: HUMAN VALUES**10Hrs**

Professional Ethics-Objectives of study of professional ethics-Human values- Definition of Morals and Ethics-Difference between Morality and Ethics-Values-Definition-Types of values- Definition of Integrity- Concept of Work Ethic- Service Learning- Definition Virtues-Definition- Civic Virtue-Duties and Rights - Respect for Others – Attitude and values, opinions-changing attitude-beliefs-Reliability-Living Peacefully-Means to be adopted for leaving peacefully-Caring-Sharing-Honesty-Valuing Time-Co-operation-Commitment-Empathy-Self-Confidence-Spirituality.

UNIT II: ENGINEERING ETHICS**09Hrs**

Engineering ethics-Definition-Approach-Senses of Engineering Ethics-variety of moral issues– Inquiry-Types-Moral dilemmas-Steps to solve dilemma-Moral autonomy –Definition-consensus & controversy –Profession-Definition–Ethical theories-Theories about right action Personality– Self control- Self-interest –Self respect.

UNIT III: SAFETY, RESPONSIBILITIES OF ENGINEERS**05Hrs**

Safety and risk-definition- - assessment of safety and risk - risk benefit analysis and reducing risk –Personal risk-Public risk-Reducing risk-Voluntary Risk-Collegiality and loyalty–Authority-Types- collective bargaining -occupational crime –Responsibility of engineers–Types-Social responsibility-Professional responsibility-confidentiality-conflicts of interest-liability

UNIT IV: ETHICAL ISSUES IN ENGINEERING PRACTICE**06Hrs**

Ethical issues–Industrial standards-Environmental ethics –Plastic waste disposal-E-Waste Disposal-Semi conductor waste Disposal-Industrial waste disposal-Human centred environmental ethics- computer ethics –Types of issues-Computer as the Instrument and Object of Unethical Acts -Engineers as managers-Codes of ethics-Sample code of Ethics like -Institution of Engineers(India)-Institute of Electrical & Electronics engineers- Institute of Electronics & Telecommunication Engineers - Indian Institute of Materials Management.

UNIT V: HUMAN RIGHTS**8 Hrs**

Human Rights-Definition-constitutional provisions-right to life and liberty-Human Rights of Women-Discrimination against women- steps that are to be taken to eliminate discrimination against women in Education, employment, health care, Economic and social life, Women in rural areas- Status of Women in India - Constitutional Safeguards - Dowry Prohibition act 1961- Domestic violence act 2005- Sexual harassment at work place bill 2006-Human Rights of Children- Who is a child- list the Rights of the Child- Right to education--Protection of Children from Sexual Offences Act(POCSO)-2012- National Human Rights Commission- Constitution- Powers and function of the Commission-Employee rights- Provisions made-Contractual-Non contractual employee rights-Whistle blowing-definition-Aspects-Intellectual Property Rights (IPR)–Meaning-Need for protection- Briefly description of concept of patents, Copy right, Trade mark.

Introduction to constitution of India-Formation and Composition of the Constituent Assembly- Salient features of the Constitution-Preamble to the Indian Constitution Fundamental Rights- Fundamental Duties-Directive principles of state policy.

Parliamentary system of governance- Structure of Parliament- Lokhasabha and Rajyasabha - Functions of parliament- Legislative, Executive, Financial Function, Powers of Loksabha and Rajya Sabha- Procedure followed in parliament in making law-Structure of union executive- Power and position of President, Vice President, Prime minister and council of ministers. Structure of the judiciary: Jurisdiction and functions of Supreme Court, high court, and subordinate courts

Federalism in the Indian constitution, Division of Powers- Union list, State list and concurrent list, Structure of state legislation, Legislative assembly and Legislative council, Functions of state legislature, Structure of state executive-Powers and positions of Governor, Speaker, Deputy Speaker, Chief Minister and council of minister.

Local self government- meaning-Three tiers system-Village panchayath-Taluk panchayath-Zilla panchayath-Local bodies-Municipalities and Corporations, Bruhath mahanagara Palike. Functions of Election commission, UPSC, KPSC.

MODEL QUESTION PAPER

4- Semester Diploma Examination

PROFESSIONAL ETHICS & INDIAN CONSTITUTION

Time: **3**

Hours]

[Max Marks: 100

Note: Answer

any SIX from Part A and any SEVEN from Part B

PART-A

6x5=30 marks

1. Distinguish between 'morality' and 'ethics'
2. Explain the terms, 'Profession', 'Professional', and 'Professionalism'?
3. Name a few techniques (steps) to reduce risks?
4. List the ill effects of E waste disposal on environment?
5. Explain the role of computers as object of Unethical Acts?
6. State various provisions under 'human rights'?
7. Differentiate between 'Patent' and 'Trade secret'?
8. State the function of Governor?
9. Write Note on gram panchayaths?

PART-B

7x10=70 marks

10. Illustrate the ethical aspect principle of caring or sharing, with an example?
11. Explain various actions of an engineer leading to dishonesty?
12. List the situations when moral dilemmas arise?

13. Distinguish between 'Social responsibility' and 'Professional responsibility'?
14. Explain Occupational crime?
15. Explain code of Ethics followed in Institution of Engineers?
16. Explain Sexual harassment at work place bill 2006?
17. Explain the basic structure of Parliament?
18. Explain the formation and functions of state high Court?
19. State the role of following members in Rajyasabha?:
 - a) Chairman
 - b) Leader of the house
 - c) Opposition leader



MODEL QUESTION BANK

4th Semester

Course title: PROFESSIONAL ETHICS & INDIAN CONSTITUTION

CO1: PRACTICE THE MORAL VALUES THAT OUGHT TO GUIDE THE ENGINEERING PROFESSION.

Level-1: Remember

1. List the key trends in engineering ethics?
2. Distinguish between 'morality' and 'ethics'?
3. List different types of values and give a few examples in each?
4. List the civic virtues one should develop?
5. List the types of virtues, with an example for each
6. List the factors for one to work peacefully?
7. List different ways the honesty reflects?
8. List the benefits of empathy?

Level-2: Understand

9. Explain the term 'respect for others' with suitable example?
10. Explain what should one do or not to do live peacefully?
11. Distinguish between 'caring' and 'sharing'?
12. What are the impediments to proper co-operation?
13. Explain the factors that shape self-confidence in a person?
14. Explain two methods of developing self-confidence?
15. Illustrate the ethical aspect principle of caring or sharing, with an example?
16. Explain various actions of an engineer leading to dishonesty?
17. Explain Service Learning?

CO2: DISCOVER OF THE SET OF JUSTIFIED MORAL PRINCIPLES OF OBLIGATION, IDEALS THAT OUGHT TO BE ENDORSED BY THE ENGINEERS AND APPLY THEM TO CONCRETE SITUATIONS

Level-1: Remember

1. List the objectives of this course 'professional ethics'?
2. Define Engineering Ethics?
3. State the two approaches to Engineering ethics?
4. Define the term, 'moral dilemma'?
5. List the situations when moral dilemmas arise?
6. List the steps in confronting moral dilemma?
7. State the five characteristics of professionals?
8. State the specific virtues relating to honesty?
9. Define 'corporate responsibility'
10. Define 'corporate accountability'?
11. List the skills required to handle moral problems/issues in engineering ethics?

Level-2: Understand

12. Why do people behave unethically?
13. Why and how do moral problems arise in a profession?
14. Explain the moral dilemma
15. Explain the difficulties in solving moral problems?
16. Explain the relation between autonomy and authority?
17. Highlight the principle of 'pre-conventional level' of moral development?
18. Explain the terms, 'Profession', 'Professional', and 'Professionalism'?
19. Describe the virtues fulfilled under professional responsibility?
20. What is moral integrity? Write on its significance?
21. Distinguish between causal responsibility, moral responsibility and Legal responsibility?
22. Where and how do moral problems arise in engineering practice? Justify the safety and other obligations of professional engineers?

CO3: KNOW THE DEFINITIONS OF RISK AND SAFETY ALSO DISCOVER DIFFERENT FACTORS THAT AFFECT THE PERCEPTION OF RISK

Level-1: Remember

1. Name the factors that influence the perception of risk?
2. List the factors that affect the risk acceptability?
3. Name a few techniques (steps) to reduce risks?
4. List various aspects of collegiality?
5. List factors/principles to justify 'confidentiality'?

Level-2: Understand

6. Describe 'institutional authority' with an example?
7. What is meant by Professional Responsibility?

Level-3: Application

8. Explain 'collective bargaining with example'?
9. Explain briefly 'institutional authority'?
10. Explain Occupational crime?

CO4: APPRECIATE THE ETHICAL ISSUES AND KNOW THE CODE OF ETHICS ADOPTED IN VARIOUS PROFESSIONAL BODY'S AND INDUSTRIES

Level-1: Remember

1. List the ill effects of E waste disposal on environment?
2. Define 'computer ethics'? List the issues in 'computer ethics'?
3. Name different types of problems in 'computer ethics'?
4. List the ethical problems by computers in workplace?

Level-2: Understand

5. Describe briefly on code of ethics?
6. What are the duties of an engineer as an experimenter, in environmental ethics?
7. How the plastic waste disposals create havocs?
8. Discuss on Industrial waste disposal creating disasters on environment?

Level-3: Application

9. Explain 'environmental ethics'?
10. Explain human centred environmental ethics?
11. Explain the role of computers as instruments?
12. Explain the role of computers as object of Unethical Acts?
13. Explain the role of engineers as managers?
14. Explain code of Ethics followed in Institution of Engineers?
15. Explain code of Indian Institute of Materials Management?

CO 5: JUSTIFY THE NEED FOR PROTECTION OF HUMAN RIGHTS AND TO KNOW ABOUT CONCEPT OF WOMEN EMPOWERMENT

Level-1: Remember

1. State various provisions under 'human rights'?
2. List the features of 'international human rights'?
3. State the provisions under professional rights?
4. State the features of the employee rights?
5. List the principles of *conflict resolution*?
6. List the various Special Programs for Women's Development from government?

Level-2: Understand

7. Describe briefly 'trademark'?
8. Differentiate between 'Patent' and 'Trade secret'?
9. Describe 'intellectual property rights'?

Level-3: Application

10. Explain briefly the 'copyright'?
11. Explain briefly about patents?
12. Explain the concept of women empowerment?
13. Explain woman and Development?
14. Explain Dowry Prohibition act 1961?
15. Explain POCSO act 2012?
16. Explain domestic violence act 2005?
17. Explain Sexual harassment at work place bill 2006?

CO6: KNOW THE SUCCESSFUL FUNCTIONING OF DEMOCRACY IN INDIA

Level-1: Remember

1. List the function and powers of parliament?
2. State the positions and powers of the Governor?
3. State the powers and Functions of the Chief Minister?
4. State the functions of Taluk panchayaths?
5. State the functions of Zilla panchayaths?
6. List the functions of urban local bodies?
7. State the powers of the president?
8. State the functions of the president?
9. State the powers and Functions of the prime minister?

Level-2: Understand

10. Describe briefly about Indian constitution?
11. Write about structure of Parliament?
12. What are the Procedure followed in parliament in making law?
13. Describe the role of gram panchayaths in community upliftment?
14. Describe the role of: a) Chairman b) Leader of the house c) Opposition leader in Rajyasabha?
15. Describe importance of Judiciary?
16. Describe the Structure of state legislation
17. Describe the Jurisdiction of Supreme court,
18. Describe the Jurisdiction high court?

Level-3: Application

19. Explain the Formation & Composition of constituent assembly?
20. Explain preamble and its main objectives of Indian constitution?
21. Explain the fundamental Rights of Every citizen?
22. Explain the fundamental Duties of Every citizen?
23. Explain salient features of Indian constitution?
24. Explain the basic structure of Parliament?
25. Explain the composition of Lokasabha?
26. Explain the composition of Rajyasabha?
27. Explain the Directive principles of state policy?
28. Explain the Structure Of The Judiciary?
29. Explain the Powers of Rajya Sabha and Loksabha ?
30. Describe briefly about, Division of Powers- Union list, State list and concurrent list,
31. Explain the federalism in the Indian constitution ?
32. Explain the role of vice president?
33. Explain the role of State council of ministers?
34. Explain the functions of Zilla panchayaths?
35. Explain the formation and functions of Supreme Court?
36. Explain the formation and functions of state high Court?
37. Explain the formation and functions of subordinate courts?
38. Explain the formation of three tier system for local self government?



Government of Karnataka
Department of Technical Education
Board of Technical Examinations, Bengaluru

Course Title: Microcontroller & Applications	Course Code : 15EC42T
Credits : 4	Semester : 4
Teaching Scheme in Hrs (L:T:P) : 4:0:0	Course Group : Core
Type of course : Lecture	Total Contact Hours : 52
CIE : 25 Marks	SEE : 100 Marks

Prerequisites

Knowledge of digital devices and exposure to programming languages

Course Objectives

To introduce the students to the architectural features of microcontrollers, capabilities of microcontroller and their utilisation.

Course Outcomes

On successful completion of the course, the students will be able to attain the following COs

Course Outcome		CL	Linked POs	Teaching Hours
CO1	Understand the architectural features of MCS-51 variants and select a suitable microcontroller to suit the application.	<i>R/U/A</i>	1,2,10	10
CO2	Develop programs for control applications using assembly language and embedded C.	<i>R/U/A</i>	1,2,3,4,10	10
CO3	Use timers and counters for delay generation and event counting.	<i>R/U/A</i>	1,2,3,4,10	09
CO4	Illustrate the use of interrupts and service routines	<i>R/U/A</i>	1,2,3,4,10	08
CO5	Write algorithms and develop programs for serial data communication applications.	<i>U/A</i>	1,2,10	08
CO6	Design microcontroller based-applications for simple real-world applications.	<i>U/A</i>	1,2,3,4,10	07
Total				52

Legends: PO-Program Outcome, CO-Course Outcome, CL-Cognitive Level, R-Remember, U-Understand, A-Apply

Course-PO attainment matrix

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
Microcontroller & Applications	3	3	3	3	--	--	--	--	--	3
<p style="text-align: center;">Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed.</p> <p>Method is to relate the level of PO with the number of hours devoted to the COs which address the given PO. If $\geq 40\%$ of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3 If 25 to 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 2 If 5 to 25% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 1 If $< 5\%$ of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed.</p>										

Course content and pattern of marks for SEE

Unit	Unit Name	Teaching Hours	Weightage for CLs in SEE			Marks	Weightage (%)
			R	U	A		
1	8051 Architecture	10	05	05	15	25	19
2	Assembly language programming	10	05	05	20	30	19
3	Embedded C	09	05	10	10	25	18
4	I/O port and Interrupts programming	08	05	10	10	25	15
5	Timers /Counters and Serial I/O	08	05	05	10	20	15
6	Interfacing the 8051	07	05	05	10	20	14
Total		52	30	40	75	145	100

Legend: R- Remember, U-Understand A-Application

Course Contents

Unit - 1: 8051 Architecture

10 Hours

Introduction to the concepts of microprocessors, microcontrollers, RISC, CISC, Harvard and Von Neumann architectures. Selection of microcontrollers, variants of MCS-51 family and their features. Applications of microcontrollers. Architecture of 8051 and its pin details. PC, DPTR, A & B registers, PSW register-flag bits, SFRs, Memory organization, general purpose RAM, bit addressable RAM, register banks, interfacing external data and code memory.

Unit - 2: Assembly language programming

10 Hours

Features of machine language, assembly language, middle-level and high-level languages. 8051 Addressing modes. Instruction set: Classification, syntax and function of instructions, example programs.

Unit – 3: Embedded C

9 Hours

Introduction to embedded C and its applicability to 8051, its pros and cons, general structure of embedded C program, data types, memory types and models, pointers, pointer's memory type,

typed and untyped pointers. Time-delay generation using loops, accessing SFRs and bit addressable RAM, arithmetic and logical operators, example programs.

Unit - 4: I/O port and Interrupts programming

08 Hours

Features of I/O ports. Byte size I/O, bit addressability and configuring I/O ports, interface I/O devices such as LED, buzzer, push-button switch, relay, example programs with assembly & C. Polling & interrupt methods, executing an interrupt, different types, IE and IP registers, enabling, disabling and priority setting, example programs in assembly and C.

UNIT -5: Timers /Counters and Serial I/O

08 Hours

Bit structure and function of TMOD and TCON registers, mode 1 & mode 2 operations of timers and counters, time delay generation & example programs in assembly and C.

Bit structure and function of SCON register, SBUF register, TI and RI flags, working of serial port, connecting 8051 to RS 232, serial data transmission and reception, example programs in assembly and C.

UNIT- 6: Interfacing the 8051

07Hours

Multiplexed seven-segment display, LCD module, ADC 0804, wave form generation using DAC 0808, DC motor-PWM for speed control, Stepper motor, appropriate schematic, and algorithm and C programs.

References

1. *The 8051 Microcontroller & Embedded systems using assembly and C (2nd Edition)* –M.A.Mazidi , J.C. Mazidi & R.D.McKinlay ISBN: 81-317-1026-2
2. *The 8051 Microcontroller(4th Edition)*- MacKenzie , ISBN:81-317-2018-7
3. *The 8051 Microcontroller(1st Edition)* – Dr.Uma Rao & Andhe Paallavi, ISBN: 81-317-3252-5
4. *Microcontrollers & applications*, Ramani Kalpathi, & Ganesh Raja , ISBN: 81-888-4918-9
5. *Embedded C* - Michael .J.Pont - Pearson Education -2002 ISBN 0 201 79523 X

Course Delivery

The course will be delivered through lectures, presentations and support of modern tools. Student activities are off-class.

Course Assessment and Evaluation Scheme

Master Scheme

Assessment Method	What		To Whom	Assessment mode /Frequency /timing	Max. Marks	Evidence Collected	Course Outcomes
Direct assessment	CIE	IA	Students	Three tests ⁺	20	Blue Books	1 to 6
		Activity*		05	Activity Sheets	1 to 6	
	SEE	End exam		End of the course	100	Answer Scripts at BTE	1 to 6
				Total	125		
Indirect assessment	Student feedback on course		Students	Middle of the Course	Nil	Feedback Forms	1 to 3 Delivery of course
	End of course survey			End of the Course	Nil	Questionnaires	1 to 6 Effectiveness of delivery instructions & assessment methods

Legends: CIE-Continuous Internal Evaluation, SEE- Semester End-exam Evaluation

⁺ Every I.A. test shall be conducted for 20 marks. Average of three tests, by rounding off any fractional part thereof to next higher integer, shall be considered for IA.

*Students should do activity as per the list of suggested activities/ similar activities with prior approval of the teacher. Activity process must be initiated well in advance so that it can be completed well before the end of the term.

Questions for CIE and SEE will be designed to evaluate the various CLs as per the weightage shown in the following table.

Sl. No.	Cognitive Levels (CL)	Weightage (%)
1	Remembering	20
2	Understanding	30
3	Applying	50
Total		100

Continuous Internal Evaluation (CIE) pattern

(i) Student Activity (5 marks)

The following student activities or similar activities can be assigned for assessing CIE/IA marks

Sl. No.	Activity	Weightage
1	Collection of features and pin diagrams of at least three controllers from following families. (1) PIC microcontrollers, (2) AVR microcontrollers, (3) ARM microcontrollers, (4) Intel microcontrollers (other than MCS-51), (5) Any other microcontroller family	50%
2	Prepare the block diagram of any one of the following real-world control application based on microcontroller. (1)Temperature control, (2) Weighing machine, (3) Humidity control, (4) Public telephone (Land-line), (5) Street-light control, (7) Washing machine control, (9) Any other application of similar nature and magnitude	
Execution Mode <ol style="list-style-type: none"> Activity 1 and 2 are mandatory for every batch; every batch can have maximum of 2 students. Activities shall be carried out batch-wise throughout the semester and submit the report per batch before the end of the semester. Report shall be qualitative and not to exceed 4 pages. Each of the activity can be carried out off-class; however, demonstration/presentation should be done in the class room. Teacher is expected to observe and record the progress of students' activities Assessment shall be made based on quality of activity in accordance with the following rubrics table. 		

(ii) Model of rubrics for assessing student activity (for every student)

Dimension	Scale					Marks (Example)
	1 Unsatisfactory	2 Developing	3 Satisfactory	4 Good	5 Exemplary	
1. Research and gathering information	Does not collect information relate to topic	Collects very limited information, some relate to topic	Collects basic information, most refer to the topic	Collects more information, most refer to the topic	Collects a great deals of information, all refer to the topic	3
2. Full-fills team roles and duties	Does not perform any duties assigned to the team role	Performs very little duties	Performs nearly all duties	Performs almost all duties	Performs all duties of assigned team roles	2
3. Shares work equality	Always relies on others to do the work	Rarely does the assigned work, often needs reminding	Usually does the assigned work, rarely needs reminding	Always does the assigned work, rarely needs reminding.	Always does the assigned work, without needing reminding	5
4. Listen to other team mates	Is always talking, never allows anyone to else to speak	Usually does most of the talking, rarely allows others to speak	Listens, but sometimes talk too much,	Listens and talks a little more than needed.	Listens and talks a fare amount	3
Total marks						ceil(13/4)= 4

(iii) CIE/IA Tests (20 Marks)

Three tests have to be conducted in accordance with the test pattern given below and average marks of them are considered for CIE/IA with specified schedule. Fractional average marks can be rounded-off to next higher integer.

(iv) Format of CIE/IA test question paper

CIE Question Paper					
Institution Name and Code					
Course Coordinator/Teacher					
<i>Program Name</i>		<i>Test No.</i>		<i>Units</i>	
<i>Class/Sem</i>		<i>Date</i>		<i>CL</i>	
<i>Course Name</i>		<i>Time</i>		<i>COs</i>	
<i>Course Code</i>		<i>Max. Marks</i>		<i>POs</i>	
Note to students: Answer all questions					
Question No.	Question	Marks	CL	CO	PO
1					
2					
3					
4					

Legends: PO-Program Outcome, CO-Course outcome, CL-Cognitive Level, R-Remember, U-Understand, A-Apply

Note: Internal choice may be given in each CO at the same cognitive level (CL).

(v) Model question paper for CIE

CIE Question Paper					
Institution Name and Code					
Course Coordinator/Teacher					
<i>Program Name</i>	Electronics and Communication	<i>Test No.</i>	1	<i>Units</i>	1 & 2
<i>Class/Sem</i>	3 rd Sem	<i>Date</i>	1/1/2017	<i>CL</i>	R/U/A
<i>Course Name</i>	Microcontroller & Applications	<i>Time</i>	10-11AM	<i>COs</i>	1 & 2
<i>Course Code</i>	15EC42T	<i>Max. Marks</i>	20	<i>POs</i>	1, 2 & 3
Note to students: Answer all questions					
No.	Question	Marks	CL	CO	PO
1	Explain the significance of PSW of 8051	05	U/A	1	1,2,3
2	List the features of 8051 microcontroller OR Write the instructions to select (i) register bank 0 and (ii) register bank 3	05	R/A	1	1,2
3	Classify the instruction set of 8051	05	U	2	1,2
4	Point out the mistake in the following instructions (i) PUSH R1 (ii) MOV R1,#398 (iii) RET label (iv) MOV R1,R2 (v) DIV A,B OR Write an ALP to convert ASCII to Hexadecimal	05	A	2	1,2

Semester End-exam Evaluation (SEE)

(i) End-exam question-paper pattern

Unit	Unit Name	Study Duration (Hrs.)	No. Questions for end-exam	
			PART – A 5 Marks	PART – B 10 Marks
1	8051 Architecture	10	01	02
2	Assembly language programming	10	02	02
3	Embedded C	09	01	02
4	I/O port and Interrupts programming	08	01	02
5	Timers /Counters and Serial I/O	08	02	01
6	Interfacing the 8051	07	02	01
	Total	52	09 (45 Marks)	10 (100 Marks)

(ii) Model question paper

Course Title : **MICROCONTROLLERS AND APPLICATIONS**

Course Code : **15EC42T**

Time : **3 Hrs**

Semester : **Third**

Max. Marks: **100**

Instructions: 1. Answer any **SIX** question from **Part A** (5x6=30 Marks)

2. Answer any **SEVEN** full questions from **Part B** (7x10=70 Marks)

Part A

- Compare the features of Harvard and von-Neumann architectures
- Indicate the uses of the following instructions (i) NOP (ii) XRL (iii) ORL (iv) ANL (v) RETI
- Write an ALP the average of 5 marks stored in internal RAM. Assume the maximum marks to be 50.
- Write C statements to do the following tasks
 - To right shift the contents of P3 by 4 bit positions
 - To set the d1 and d3 bit of P1
- Discuss the interrupt priority order achieved by the execution of MOV IP,#11H instruction
- Calculate the values that are to be loaded into TH1 In order to get the following baud rates (i) 2400 (ii) 9600
- Summarize the scheme of interfacing RS232 to 8051
- Write the schematic for interfacing ADC 0804 to 8051
- Sketch the schematic for interfacing a 8X2 alphanumeric LCD to 8051 in 8 bit data mode

Part B

- Explain the internal RAM organization of 8051
- Describe the method of interfacing 4K data RAM to 8051 microcontroller
- Explain any 5 single bit instructions of 8051
- Write an ALP to find the smallest of n 8bit numbers
- Write a C program to read P1.2 and send it to P2.3 after inverting it.
 - Write a 8051 C program to convert unpacked BCD to ASCII and to display it on P0
- Write a 8051 C program to convert a 8 bit hexadecimal number to ASCII after converting it to unpacked BCD and to display the ASCII digits on P0,P1 and P2

- (b) The data stored in RAM are 25h,22h,3fh,52h and E8h where E8 is the check sum byte. Write a 8051 C program to check the data integrity. If data is good send ASCII character 'G' to P0 otherwise send 'B'
7. Write the schematic, algorithm and a program for 8051 to sense the push button switch and accordingly control the on/off of LED
 8. Summarize the different interrupts of 8051 w.r.t the method of their activation and IVL
 9. Write an ALP and a 8051 C program to generate a time delay of 50mS. Use timer1 in mode1 and a crystal frequency of 12MHz
 10. Write the schematic, algorithm and a program to interface a DAC to 8051 and to generate a triangular waveform
 - 11.

Institutional activities (No marks)

The following are suggested institutional activities, to be carried out at least one during the semester. The course teacher/coordinator is expected to maintain the relevant record (Containing, Activity name, Resource persons and their details, duration, venue, student feedback, etc) pertaining to Institutional activities.

Sl. No.	Activity
1	Organize seminar workshop or lecture from experts on the modern trends in microcontrollers
2	Motivate students to take case study on different microcontroller-based mini projects (small applications such as applications specified in student activity) to inculcate self and continuous learning

Model Question Bank

Note: The questions in the question bank are indicative but not exhaustive. Sub-questions on different CLs may be combined in 10-marks questions or 10-marks questions can be splitted into if necessary keeping weightage of CLs approximately intact.

Unit-1

5-Mark questions

1. List the features of 8051 microcontroller
2. Differentiate between a microcontroller and microprocessor
3. Compare the features of Harvard and von-Neumann architectures
4. Compare the features of RISC and CISC
5. Explain the significance of PSW of 8051
6. List the functions of any 5 SFRs
7. List the points to be considered during the selection of a microcontroller for an application
8. Name the pins of 8051 used for external memory interfacing and list their functions.
9. List the functions of conditional and user flags of 8051
10. Identify to which M.L, the data is moved after the execution of the following program segment
 SETB RS1
 CLR RS0
 MOV R1,#25h
 MOV R3,#65h
11. Write the instructions to select (i) register bank 0 and (ii) register bank 3

10-Mark questions

1. Explain the architecture of 8051 microcontroller
2. List the functions of different pins of 8051
3. Describe the method of interfacing 2K data RAM to 8051 microcontroller
4. Describe the method of interfacing 4K data RAM to 8051 microcontroller
5. Describe the method of interfacing 8K PROM to 8051 microcontroller
6. Explain the functions of regA, regB, PC, SP and DPTR
7. Explain the internal RAM organization of 8051

Unit-2

5-Mark questions

1. Identify the addressing modes of the following instructions (i) PUSH (ii) MOV A,R1 (iii) MOV A,@R1 (iv) JNC AHEAD (v) MOV A,@A + PC
2. Differentiate between an assembly instruction and assembler directive
3. Classify the instruction set of 8051
4. Indicate the uses of the following instructions (i) NOP (ii) XRL (iii) ORL (iv) ANL (v) RETI
5. Point out the mistake in the following instructions (i) PUSH R1 (ii) MOV R1,#398 (iii) RET label (iv) MOV R1,R2 (v) DIV A,B
6. Explain the different branch address ranges supported by 8051 instructions
7. Write an ALP to transfer a block of data from one portion of internal RAM to another
8. Write an ALP the average of 5 marks stored in internal RAM. Assume the maximum marks to be 50.
9. Write an ALP to convert ASCII to Hexadecimal
10. Write an ALP to convert hexadecimal to ASCII

10-Mark questions

1. Explain the addressing modes of 8051
2. Explain any 5 conditional branch instructions of 8051
3. Explain any 5 single bit instructions of 8051
4. Write an ALP to find the largest of n 8bit numbers
5. Write an ALP to find the smallest of n 8bit numbers
6. Write an ALP to arrange a list 8bit numbers in ascending order
7. Write an ALP to arrange a list 8bit numbers in descending order
8. Write an ALP to search for a given 8bit number in a list of n 8 bit numbers

Unit-3

5-Mark questions

1. List the advantages and disadvantages of using 8051 C
2. Show how octal, hexadecimal and decimal numbers are represented in 8051 C
3. Explain the different logical operators available in 8051C
4. Explain the different arithmetic operators available in 8051C
5. Explain the different data types available in 8051C
6. Explain the different memory models available in 8051C
7. Explain the different memory type specifiers available in 8051C
8. Write C statements to do the following tasks
 - (i) To toggle the content of P0
 - (ii) To left shift the content of P2 by 2 bit positions
9. Write C statements to do the following tasks
 - (i) To mask the d3 and d5 bits of P0
 - (ii) To toggle the d7 and d3 bit of P2
10. Write C statements to do the following tasks
 - (i) To mask the d3 and d5 bits of P0
 - (ii) To toggle the d7 and d3 bit of P2
11. Write C statements to do the following tasks
 - (iii) To right shift the contents of P3 by 4 bit position
 - (iv) To set the d1 and d3 bit of P1

10-Mark questions

- (a) Write a C program to read P1.2 and send it to P2.3 after inverting it.
(b) Write a 8051 C program to convert unpacked BCD to ASCII and to display it on P0
- (a) Write a 8051 C program to toggle all the bits of P0 for every 500ms
(i) by using NOT operator (ii) by using EX-OR operator
(b) Write a 8051 C program to convert ASCII into unpacked BCD and send it to P0
- (a) Write a 8051 C program to do the following (i) Clear P0 contents using EX -OR (ii) Set D4 bit of memory location temp1 without affecting other bits (iii) Mask D5 and D3 bits of memory location temp2
(b) Write a 8051 C program to read P1.0 and P1.1 bits and send ASCII characters '0', '1', '2' and '3' to P0 for the combination 00,01,10 and 11 of P1.1 and P1.0 bits
- (a) Write a 8051 C program to convert packed BCD to ASCII and to display it on P1 and P2
(b) Write a 8051 C program to convert ASCII digits '4' and '7' into packed BCD and to display on port P1
- (a) Write a 8051 C program to convert a 8 bit hexadecimal number to unpacked BCD and to display it on P0,P1 and P2
(b) Write a 8051 C program to output the checksum byte for the 4 bytes of data 25h,62h,3fh and 52h on to port P3
- (a) Write a 8051 C program to convert a 8 bit hexadecimal number to ASCII after converting it to unpacked BCD and to display the ASCII digits on P0,P1 and P2
(b) The data stored in RAM are 25h,22h,3fh,52h and E8h where E8 is the check sum byte. Write a 8051 C program to check the data integrity. If data is good send ASCII character 'G' to P0 otherwise send 'B'

Unit-4

5-Mark questions

- List the advantages and disadvantages of using an interrupt
- Compare the interrupt method and polling method of servicing devices
- Differentiate between an ISR and a subroutine
- Explain the bit structure of IP register
- Explain the bit structure of IE register
- List the steps involved in executing an interrupt
- Explain the method of enabling only timer interrupts and disabling others
- Explain the method of enabling only external hardware interrupts and disabling others
- Discuss the interrupt priority order achieved by the execution of MOV IP,#11H instruction
- Differentiate between RET and RETI
- List the interrupts of 8051 and their vector locations

10-Mark questions

- Summarize the different interrupts of 8051 w.r.t the method of their activation and IVL
- Write the schematic, algorithm and a program for 8051 to sense the push button switch and accordingly control the on/off of LED
- Write an algorithm and a C program to monitor the door sensor connected to the pin P1.1 when the door opens sound the buzzer connected to P1.7. The buzzer is to be sounded by sending a square wave of a few 100Hz
- Write an ALP and a C program to send values 0 to 4 to port P2
- Write an ALP and a C program to toggle bit 1 of Port 0 25000times
- Write an ALP and a C program to continuously send 00h to 20h to port P0
- Write an ALP and a C program to toggle the bits of port P3 continuously
- Write an ALP and a C program to display the ASCII values characters 0,1,A and B on port P2 only once
- Write an ALP and a C program to toggle the bit 1 of port P0 continuously

10. Unit-5

5-Mark questions

1. Differentiate between timers and counters
2. Explain the features of timer0 and timer1 registers
3. Explain the significance of SBUF register
4. Explain the significance of SI and RI flags
5. Calculate the values that are to be loaded into TH1 In order to get the following baud rates (i) 2400 (ii) 9600
6. List the steps involved in serial data transmission
7. List the steps involved in serial data reception
8. Summarize the scheme of interfacing RS232 to 8051
9. Explain the uses of TCON register
10. Explain how a programmer select external hardware interrupts as level triggered interrupts
11. Explain how a programmer select external hardware interrupts as edge triggered interrupts
12. Explain the operation of timer0 in mode 1
13. Explain the operation of timer1 in mode 2
14. Explain the operation of counter0 in mode 1

10-Mark questions

1. Explain the bit structure of TMOD register
2. Explain the bit structure of SCON register
3. Write an ALP to receive data serially at a baud rate of 4800 and send the received data to R1
4. Write an ALP to receive data serially at a baud rate of 9600 and send the received data to P1
5. Write an ALP to transmit the letter 'A' serially at a baud rate of 2400
6. Write an ALP to transmit the message "YES" serially at a baud rate of 4800
7. Write an ALP and a8051 C program to generate a time delay of 50mS. Use timer1 in mode1 and a crystal frequency of 12MHz.
8. Write an ALP and a8051 C program to generate a square wave of on period 100microseconds and an off period of 100microseconds at P1.2 . Use timer0 in mode 2 and a crystal frequency of 12MHz.
9. Write an ALP and a8051 C program to generate a square wave of 10KHz at P1.2 . Use timer1 in mode 2 and a crystal frequency of 10MHz
10. Write an ALP and a8051 C program to generate a square wave of 25% duty cycle and an on period of 10mS at P1.4 . Use timer0 in mode 1 and a crystal frequency of 12MHz
11. Write an ALP and a C program to read the content of P0 and send it to P1 after a time delay of 100mS. Use a crystal frequency of 12MHz

Unit-6

5-Mark questions

1. Write the schematic for interfacing a 4 digit multiplexed 7 segment display to 8051
2. Write the schematic for interfacing ADC 0804 to 8051
3. Sketch the schematic for interfacing DC motor to 8051
4. Sketch the schematic for interfacing a 8X2 alphanumeric LCD to 8051 in 4 bit data mode
5. Sketch the schematic for interfacing a 8X2 alphanumeric LCD to 8051 in 8 bit data mode
6. Sketch the schematic for interfacing a stepper motor to 8051
7. List the pins of alphanumeric LCD module which help in interfacing with the microcontroller.

10-Mark questions

1. Write the schematic, algorithm and a program to interface 4 digit multiplexed 7 segment display to 8051 and display 2016

2. Write the schematic, algorithm and a program to interface a stepper motor to 8051 and to rotate the motor in anti clock wise direction using wave drive sequence
3. Write the schematic, algorithm and a program to interface a stepper motor to 8051 and to rotate the motor in clock wise direction using normal 4 step sequence
4. Write the schematic, algorithm and a program to interface a DC motor to 8051 and to run the motor with 35% duty cycle
5. Write the schematic, algorithm and a program to interface a alphanumeric LCD to 8051 and to display 'INDIA'
6. Write the schematic, algorithm and a program to interface a DAC to 8051 and to generate a triangular waveform
7. Write the schematic, algorithm and a program to interface a ADC 0804 to 8051

End

Government of Karnataka
Department of Technical Education
Board of Technical Examinations, Bengaluru

Course Title : Digital Communication	Course Code : 15EC43T
Semester : 4	Course Group : Core
Teaching Scheme in Hrs (L:T:P) : 4:0:0	Credits : 4
Type of course : Lecture + Assignments	Total Contact Hours : 52
CIE : 25 Marks	SEE : 100 Marks

Prerequisites

Knowledge of analog communication, analog electronic circuits and digital electronics.

Course Objectives

1. Understand the working of Digital Communication Systems.
2. Understand and analyze the different coding, digital modulation and multiplexing techniques.
3. Know the types of transmission media and elements of optical fiber system.

Course Outcomes

On successful completion of the course, the students will be able to attain the following COs

Course Outcome		CL	Linked PO	Teaching Hrs
CO1	Understand the digital communication techniques	R/U/A	1,2,3,9,10	09
CO2	Recognize the digital coding of analog signals and line coding techniques	R/U/A	1,2,3,9,10	07
CO3	Distinguish the digital modulation schemes.	U/A	1,2,3,9,10	12
CO4	Recognize the different types of multiplexing and multiple access methods.	U/A	1,2,3,4,9,10	06
CO5	Analyze the error detection and correction methods.	R/U/A	1,2,3,9	06
CO6	Differentiate types of transmission media and understand fiber optic system.	R/U/A	1,2,3,9,10	12
Total				52

Legends: PO-Program Outcome, CO-Course Outcome, CL-Cognitive Level, R-Remember, U-Understand, A-Apply

Course-PO attainment matrix

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
Digital Communication	3	3	3	1	--	--	--	--	3	3
<p style="text-align: center;">Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed.</p> <p>Method is to relate the level of PO with the number of hours devoted to the COs which address the given PO. If $\geq 40\%$ of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3 If 25 to 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 2 If 5 to 25% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 1 If $< 5\%$ of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed.</p>										

Course content and pattern of marks for SEE

Unit No	Unit Name	Hour	Questions to be set For SEE			Marks Weightage	Weightage (%)
			R	U	A		
1	Digital communication techniques	09	05	10	10	25	17
2	Digital coding of analog Signals	07	05	05	10	20	13
3	Digital modulation techniques	12	05	05	20	30	23
4	Multiplexing techniques and multiple Access	06	05	05	10	20	12
5	Error Detection and Correction	06	05	05	10	20	12
6	Transmission Media	12	05	10	15	30	23
Total		52	30	40	75	145	100

Legend: R- Remember, U-Understand A-Application

Course Contents

Unit - 1: Digital communication techniques

09 Hours

Definition of signal and classification. Functional Block diagram of digital communication system. Comparison of analog and digital communications. Base band and pass band transmission. Definition of information capacity, entropy, bit-rate, baud rate and bandwidth of digital data and solve simple problems. Shannon's theorem, Shannon-Hartley theorem, amount of

information, sampling process, and sample and hold circuit. Types of sampling. Sampling theorems for low pass and band pass signals. Nyquist criterion and aliasing effect. Analog pulse modulation techniques-PAM, PPM, PWM.

Unit - 2: Digital coding of analog Signals **07 Hours**

Quantization. Definition, process and classification. Pulse-code modulation system and DPCM Quantization noise and companding process. Delta modulation system and adaptive delta modulation. Applications, advantages and disadvantages in each case. Comparison of different pulse modulation methods. Line coding and types - unipolar RZ and NRZ, Polar RZ and NRZ, bipolar NRZ (AMI), split phase Manchester format with examples.

Unit – 3: Digital modulation techniques **12 Hours**

Base band transmission of binary data. Significance of inter symbol interference (ISI) and eye pattern. Digital modulation techniques-Binary and M-ary. Generation and detection(coherent and non-coherent) of Binary ASK, FSK, PSK, QPSK(Coherent only), DPSK. Merits/demerits and applications. Concept of Minimum Shift Keying (MSK) and GMSK. Comparison of different modulation techniques.

Unit - 4: Multiplexing techniques and multiple Access **06 Hours**

Concept of FDM and TDM, 4-channel PAM/TDM system, signaling rate, transmission bandwidth, synchronization, crosstalk and guard time. Digital multiplexers-principle, classification. Performance factors- bit rate, transmission channel bandwidth. Solve simple problems. Advantages and disadvantages of TDM. Working principle of T1 digital carrier system. Multiple access methods-TDMA, FDMA and CDMA and Comparison.

Unit -5: Error Detection and Correction **06 Hours**

Definition of error, types of errors and redundancy, error control strategies, error control codes, Parity check bit coding, LRC, VRC, CRC, Checksum with examples.

Unit- 6: Transmission Media **12 Hours**

Classification of transmission media: guided and unguided media, construction, merits, demerits and applications of twisted pair, co-axial and optical fibers. Block diagram of basic fiber optic communication system. Optical fiber-principle of operation, numerical aperture, angle of acceptance, configurations, losses, splices, connectors, couplers and switches. Optical emitters-LED and semiconductor LASERS, Optical detectors-APD and PIN diode and concepts of WDM.

References

1. *Digital Communication Systems*, Simon Haykin, Wiley India, ISBN:9788126542314
2. *Digital and analog communication systems*, K.Sham Shanmugam, Wiley India, ISBN:978126536801.
3. *Fiber Optic Communication systems*, 3ed, w/cd, Agarwal, Wiley India, ISBN:9788126513864.
4. *Analog and Digital Communications*, T. L. Singal, McGraw Hill Education (india) Pvt. Ltd. New Delhi. ISBN 10: 0071072691 ISBN 13: 9780071072694.
5. *Digital Communications*, P. Ramkrishna Rao, McGraw Hill Education (india) Pvt. Ltd. New Delhi. ISBN-10:0-07-070776-6, ISBN-13:978-0-07-070776-4.
6. *Principles of Electronic Communication Systems*, Louis E. Frenzel, Tata McGraw Hill Education Pvt. Ltd. New Delhi, ISBN-13:978-0-07-066755-6, ISBN-10:0-07-066755-1.
7. *Introduction to Analog & Digital Communications*, 2ed, Haykin, Wiley India, ISBN:9788126536535.
8. *Fiber Optic Communication Systems*, Dr.R.K.Singh, Wiley India, ISBN:9788126531349.

9. <http://electronicdesign.com/communications/understanding-modern-digital-modulation-techniques>
10. https://www.youtube.com/watch?v=Q_-Bts76Tfl
11. <https://www.youtube.com/watch?v=YJmUkNTBa8s>
12. <https://www.youtube.com/watch?v=7h2xr-pi5VQ>
13. <https://www.youtube.com/watch?v=Wh9knsYSodI>
14. <https://www.youtube.com/watch?v=PWaNMjimtP0>
15. <https://www.youtube.com/watch?v=9VmA2S2XiCo>
16. <https://www.youtube.com/watch?v=ifgs0uypC78>
17. <https://www.youtube.com/watch?v=pIIBlNW7sOo>
18. <https://www.youtube.com/watch?v=aNqiTCZ-nko>

Course Delivery

The course will be delivered through lectures, presentations and support of modern tools.

Course Assessment and Evaluation Scheme

Master Scheme

Assessment Method	What		To Whom	Assessment mode /Frequency /timing	Max. Marks	Evidence Collected	Course Outcomes
Direct assessment	CIE	IA	Students	Three tests ⁺	20	Blue Books	1 to 6
				Activity*	05	Activity Sheets	1 to 6
	SEE	End exam		End of the course	100	Answer Scripts at BTE	1 to 6
				Total	125		
Indirect assessment	Student feedback on course		Students	Middle of the Course	Nil	Feedback Forms	1 to 3 Delivery of course
	End of course survey			End of the Course	Nil	Questionnaires	1 to 6 Effectiveness of delivery instructions & assessment methods

Legends: CIE-Continuous Internal Evaluation, SEE- Semester End-exam Evaluation

⁺ Every I.A. test shall be conducted for 20 marks. Average of three tests, by rounding off any fractional part thereof to next higher integer, shall be considered for IA.

*Students should do activity as per the list of suggested activities/ similar activities with prior approval of the teacher. Activity process must initiated well in advance so that it can be completed well before the end of the term.

Questions for CIE and SEE will be designed to evaluate the various CLs as per the weightage shown in the following table.

Sl. No.	Cognitive Levels (CL)	Weightage (%)
1	Remembering	20
2	Understanding	30
3	Applying	50
Total		100

Continuous Internal Evaluation (CIE) pattern

(i) Student Activity (5 marks)

The following student activities or similar activities can be assigned for assessing CIE/IA marks

Sl. No.	Activity
1	Collect and prepare a handwritten brief report on the functional blocks in digital communication system such as scramblers, unscramblers, equalizers or clock recovery circuits with specifications and applications.
2	Recognize/identify the digital modulation technique and line coding for the voice signal transmission in telephone system and Prepare a brief handwritten report with specifications and applications.
3	Visit a nearest telephone exchange, collect and prepare a handwritten brief report on optical fibers for the communication purpose with specifications.
4	Identify the type of multiplexing and multiple access technique used for the mobile communication purpose and Prepare a handwritten brief report on any one with specifications and applications.
5	Recognize the optical emitters or optical detectors used for optical fiber communications and prepare a handwritten report that includes specifications, cost, applications, etc.

Execution Mode

1. At least one activity is mandatory for each batch of 2 students; carried throughout the semester and submit the report before the end of the semester.
2. Report shall be qualitative and not to exceed 6 pages.
3. Activity can be carried out off-class; however, demonstration/presentation should be done in the class room.
4. Teacher is expected to observe and record the progress of students' activities
5. Assessment is made based on quality of work as prescribed by the following rubrics table.

(ii) Model of rubrics for assessing student activity

Dimension	Scale					Marks (Example)
	1 Unsatisfactory	2 Developing	3 Satisfactory	4 Good	5 Exemplary	
1. Research and gathering information	Does not collect information relate to topic	Collects very limited information, some relate to topic	Collects basic information, most refer to the topic	Collects more information, most refer to the topic	Collects a great deals of information, all refer to the topic	3
2. Full-fills team roles and duties	Does not perform any duties assigned to the team role	Performs very little duties	Performs nearly all duties	Performs almost all duties	Performs all duties of assigned team roles	2
3. Shares work equality	Always relies on others to do the work	Rarely does the assigned work, often needs reminding	Usually does the assigned work, rarely needs reminding	Always does the assigned work, rarely needs reminding.	Always does the assigned work, without needing reminding	5
4. Listen to other team mates	Is always talking, never allows anyone to else to speak	Usually does most of the talking, rarely allows others to speak	Listens, but sometimes talk too much,	Listens and talks a little more than needed.	Listens and talks a fare amount	3
Total marks						ceil(13/4)= 4

(iii) CIE/IA Tests (20 Marks)

Three tests have to be conducted, during specified schedule, in accordance with the test pattern given below and their average-marks shall be considered for CIE/IA.

(iv) Format of CIE/IA test question paper

CIE Question Paper							
Institution Name and Code							
Course Coordinator/Teacher							
<i>Program Name</i>		<i>Test No.</i>		<i>Units</i>			
<i>Class/Sem</i>		<i>Date</i>		<i>CL</i>			
<i>Course Name</i>		<i>Time</i>		<i>COs</i>			
<i>Course Code</i>		<i>Max. Marks</i>		<i>POs</i>			
Note to students: Answer all questions							
Question No.	Question			Marks	CL	CO	PO
1							
2							
3							
4							

Legends: PO-Program Outcome, CO-Course outcome, CL-Cognitive Level, R-Remember, U-Understand, A-Apply
Note: Internal choice may be given in each CO at the same cognitive level (CL).

(v) Model question paper for CIE

CIE Question Paper					
Institution Name and Code					
Course Co-ordinator/Teacher					
Program Name	Electronics and Communication	Test No.	1	Units	1 & 2
Class/Sem	4 th Sem	Date	1/1/2017	CL	R/U/A
Course Name	Digital Communication	Time	10-11AM	COs	1 & 2
Course Code	15EC43T	Max. Marks	20	POs	1, 2 & 3
Note to students: Answer all questions					
No.	Question	Marks	CL	CO	PO
1	Define signal and classify them.	05	U/A	1	1,2,3
2	State the sampling theorem for the low pass signals	05	R/A	1	1,2
3	Mention the merits, demerits and applications of data compression	05	R	2	1,2
4	Describe briefly the delta modulation system with the help of block diagram.	05	A	2	1,2

Semester end-exam evaluation (SEE)

(i) End-exam question-paper pattern

Unit No.	Unit Name	Study Duration (Hrs.)	No. Questions for End-exam	
			5 Marks PART - A	10 Marks PART - B
1	Digital communication techniques	09	01	02
2	Digital coding of analog signals	07	02	01
3	Digital modulation techniques	12	02	02
4	Multiplexing techniques and multiple access	06	01	1.5
5	Error detection and correction	06	01	1.5
6	Transmission media	12	02	02
	Total	52	09 (45 Marks)	10 (100 Marks)

(ii) Model question paper

Course Title : Digital Communication

Course Code : 15EC43T

Time : 3 Hrs

Semester : Fourth

Max. Marks: 100

Instructions: 1. Answer any **SIX** question from **Part A** (5x6=30 Marks)

2. Answer any **SEVEN** full questions from **Part B** (7x10=70 Marks)

Part A

1. Define signal and classify them.
2. Describe the working of sample and hold circuit.
3. Illustrate briefly RZ and NRZ format for the unipolar signaling format with waveform.
4. Write a brief note on eye pattern.
5. What do you mean by inter symbol interference? Name the types of digital carrier modulation schemes.
6. What is multiplexing? Mention the advantages.
7. What is error in digital communication? Describe briefly the types of errors.
8. Describe briefly the types of transmission media.
9. Mention the advantages of optical fiber media.

Part B

1. (a) State the sampling theorem for the low pass signals. (4)
(b) Describe briefly the generation of PAM signal. (6)
2. Describe briefly the functional block diagram of digital communication system. (10)
3. (a) Define quantization and name the types. (3)
(b) Describe briefly the quantization process of an analog signal. (7)
4. Explain the block diagram of pulse code modulation system. (10)
5. (a) Describe binary ASK scheme with the help of waveform. (4)
(b) Explain briefly the coherent detection of binary ASK. (6)
6. (a) Describe briefly the generation of binary PSK signal. (5)
(b) List the advantages and disadvantages of error control codes (5)
7. (a) Describe the working of 4 channel PAM/TDM system. (6)
(b) Write a brief note on CDMA. (4)
8. (a) Write a note on error control strategies. (6)
(b) Differentiate bit error and burst error. (4)
9. (a) Describe briefly the principle of operation of optical fiber. (6)
(b) What is angle of acceptance and numerical aperture? (4)
10. (a) Describe briefly the principle of operation of LED. (6)
(b) List the advantages and limitations of optical fiber. (4)

Institutional activities (No marks)

The following are suggested institutional activities, to be carried out at least one during the semester. The course teacher/coordinator is expected to maintain the relevant record (Containing, Activity name, Resource persons and their details, duration, venue, student feedback, etc) pertaining to Institutional activities.

Sl. No.	Activity
1	Organize seminar, workshop or lecture from experts on the modern trends in digital communication
3	Motivate students to take case study on different digital communication-based mini projects (small applications such as applications specified in student activity) to inculcate self and continuous learning

Model Question Bank

Note: The questions in the question bank are indicative but not exhaustive. Sub-questions on different CLs may be combined in 10-marks questions or 10-marks questions can be splitted into if necessary keeping weightage of CLs approximately intact.

UNIT-1

5-mark questions

1. Define signal and classify them.
2. Mention the merits and demerits of pass band transmission.
3. Define information capacity and state Shannon's theorem.
4. Define bit-rate, entropy and baud rate.
5. Write note on aliasing effect.
6. Compare analog and digital communication systems.
7. Describe briefly the sampling process.
8. State the Shannon-Hartley theorem.
9. Write a brief note on baseband and pass band transmission.
10. A discrete information source generates one of five possible messages during
11. each message interval. The probabilities of these messages are $P_1=1/2$, $P_2=1/4$,
12. $P_3=1/8$, $P_4=1/8$ and $P_5=1/16$. Find the information content of each of these messages.

10-mark Questions

1. Define the following signals: (2x5=10)
 - a. Continuous and Discrete time signals
 - b. Analog and Digital signals
 - c. Deterministic and Random signals
 - d. Even and Odd signals
 - e. Periodic and Non-periodic signals
2. Describe briefly the functional block diagram of digital communication system. (10)
3. (a) State the sampling theorem for the low pass signals. (5)
4. (b) State the sampling theorem for the band pass signal. (5)
5. (a) Describe briefly the sample and hold circuit. (6)
6. (b) Define the terms: (i) Amount of information (ii) Baud rate. (4)
7. (a) Describe briefly the generation and detection of PAM signals.(8)
8. (b) Mention the types of analog pulse modulation. (2)
9. (a) Describe the generation of PWM. (6)
10. (b) Mention the merits and demerits of PWM. (4)
11. (a) Describe the generation of PPM. (6)
12. (b) Write the merits and demerits of PPM. (4)

UNIT-2

5-mark questions

Remember

1. Define quantization and quantization noise.
2. Mention the advantages, disadvantages and applications of PCM.
3. Mention the merits, demerits and applications of data compression.
4. List the merits, demerits and applications of bipolar signaling.

Understand

1. Describe RZ and NRZ unipolar signaling format with waveforms.
2. Describe RZ and NRZ polar signaling format with waveforms.
3. Describe RZ and NRZ bipolar signaling format with waveforms.
4. Describe briefly the distortion in delta modulation.
5. Write a brief note on companding process.

10-mark Questions

Understand

1. (a) Describe briefly the delta modulation system with the help of block diagram. (8)

- (b) Mention the merits and demerits of delta modulation system. (2)
- 2. (a) Describe briefly the DPCM system. (8)
- (b) Mention the merits and applications of DPCM. (2)
- 3. (a) Compare different pulse code modulation systems. (4)
- (b) Write the advantages and disadvantages of bipolar and Manchester formats. (6)
- 4. (a) Name the types of quantization techniques. (2)
- (b) Describe briefly the quantization process. (8)

Application

- 1. (a) Describe briefly the Manchester format with waveform. (5)
- (b) Illustrate the NRZ unipolar signaling format with an example. (5)
- 2. Describe briefly the pulse code modulation system with the help of functional block diagram. (10)

UNIT-3

5-mark Questions

- 1. Write a brief note on base band transmission.
- 2. Explain briefly about eye pattern.
- 3. What is the significance of inter symbol interference?
- 4. What is digital modulation? Name the types of digital modulation techniques.
- 5. Describe briefly the generation of binary ASK.
- 6. Explain briefly the generation of binary PSK.
- 7. Write a brief note on MSK.
- 8. Mention the merits and demerits of MSK.
- 9. Mention the merits and demerits of DPSK.

10-mark Questions

- 1. (a) Describe briefly the coherent detection of binary ASK. (7)
- (b) Write the merits, demerits and applications of binary ASK. (3)
- 2. (a) Describe briefly the binary ASK with the help of waveforms. (4)
- (b) Explain briefly the non-coherent detection of binary ASK. (6)
- 3. (a) Describe briefly the generation of binary FSK. (7)
- (b) Explain briefly the binary FSK with the help of waveforms. (3)
- 4. (a) Describe briefly the coherent detection of binary FSK. (7)
- (b) Mention the merits, demerits and applications of binary FSK. (3)
- 5. (a) Explain briefly the non-coherent detection binary FSK. (7)
- (b) Describe briefly the binary FSK with the help of waveforms. (3)
- 6. (a) Describe briefly the coherent detection of binary PSK signals. (7)
- (b) Mention the merits, demerits and applications of binary PSK. (3)
- 6. (a) Describe briefly the QPSK transmitter. (8)
- (b) Mention the advantages and disadvantages of QPSK. (2)
- 7. (a) Describe briefly the coherent QPSK receiver. (8)
- (b) Mention the applications of QPSK. (2)
- 8. Describe briefly the transmission and detection of DPSK signal. (10)
- 9. (a) Write a brief note on GMSK. (5)
- (b) Compare the different digital modulation techniques. (5)

UNIT-4

5-mark Questions

- 1. What is multiplexing? Write the advantages of multiplexing.
- 2. Write the concept of TDM.
- 3. Write the concept of FDM.

4. Explain briefly about of crosstalk and guard time.
5. What is multiple access technique? Name the types.
6. Write a brief note on FDMA.
7. Mention the limitations of FDMA.

10-mark Questions

1. (a) Write briefly about the working principle of T1 carrier system. (6)
(b) Write the advantages and disadvantages of TDM. (4)
2. (a) Describe the working of 4 channel TDM/PAM system. (6)
(b) Describe signaling rate and synchronization. (4)
3. (a) Write briefly about CDMA technique. (6)
8. (b) Write the benefits of CDMA. (4)
4. (a) What is multiplexing? Determine the minimum bandwidth required for PAM/TDM system in which six different message signals with each signal bandwidth of 10KHz are to to be multiplexed and transmitted. (5)
(b) Write a brief note on TDMA. (5)

UNIT-5

5-mark Questions

1. Describe briefly about an error and name the types.
2. Describe briefly about single bit error and burst error.
3. Write a brief note on redundancy.
4. Write a brief note on ARQ error control scheme.
5. Describe briefly about forward error detection and correction.
6. Write a brief note on block code.
7. Write a brief note on checksum coding technique.

10-mark Questions

1. (a) Describe parity bit check coding method. (5)
(b) Explain briefly the VRC method of coding. (5)
2. (a) Write a brief note on CRC coding method. (6)
(b) Write the merits demerits and applications of parity bit method. (4)
3. (a) Describe briefly about LRC coding method. (6)
(b) Mention the merits, demerits and applications of checksums method. (4)
4. (a) Describe briefly the convolution encoding operation. (6)
(b) Mention the applications of error control schemes. (4)

UNIT-6

1. What do you mean by transmission media and name the types.
2. Write a brief note on twisted pair cable.
3. Write the merits and demerits of twisted pair cable.
4. Mention the applications of twisted pair cable.
5. Write a brief note co-axial cable.
6. Write the merits, demerits and applications of coaxial cable.
7. Describe the construction of an optical fiber.
8. List the advantages of an optical fiber.
9. Write the applications of optical fiber.
10. Mention the demerits of an optical fiber.
11. Describe briefly about an optical window.
12. Write the merits, demerits and applications of LED.

10-mark Questions

1. (a) Write the principle of light propagation in an optical fiber. (6)
(b) Describe numerical aperture and angle of acceptance. (4)
2. (a) Describe briefly the types of optical fiber configurations. (6)
(b) Write the limitations of an optical fiber. (4)
3. (a) Write a brief note on different types fiber optic connectors. (6)
(b) Write a brief note on splices. (4)
4. (a) Explain briefly the construction of LED. (7)
(b) Compare LED and semiconductor lasers. (3)
5. Describe the block diagram of an optical fiber communication system. (10)
6. (a) Write a brief note on step index and graded index cables. (6)
(b) Write the multimode step-index cable advantages, disadvantages and applications. (4)
7. (a) Write a note on multimode step-index fiber.(5)
(b) Mention the advantages, disadvantages and applications of multimode step-index fiber. (5)
8. (a)What do you mean fiber losses? Describe briefly the different fiber lossess.(10)
9. Describe briefly about optical couplers and optical switches. (10)
10. (a) Describe briefly the construction of semiconductor LASER. (6)
(b) Mention the merits, demerits and applications of laser diode. (4)

End

**Government of Karnataka
Department of Technical Education
Board of Technical Examinations, Bengaluru**

Course Title : Data Communication and Networking	Course Code : 15EC44T
Semester : Fourth	Course Group : Core
Teaching Scheme in Hrs (L:T:P) : 4:0:0	Credits : 4
Type of course : Lecture	Total Contact Hours: 52
CIE : 25 Marks	SEE : 100 Marks

Prerequisites

Basics concepts of communication, digital electronics and computers.

Course Objectives

1. To understand the basic concepts of data communication, layered model, protocols and inter-working between computer networks and switching components in telecommunication systems.
2. Discuss the nature, uses and implications of internet technology.
3. To understand the functioning of Frame Relay, ATM.
4. An overview of security issues related to data communication in networks.

Course Outcomes

On completion of the course, students will be able to attain the following COs

Course Outcome		CL	Linked PO	Teaching Hrs
CO1	Understand the basics of data communication, networking, internet and their importance.	R/U/A	1,2,5,6,7,9,10	7
CO2	Analyze the services and features of various protocol layers in data networks.	R/U/A	1,2,3,4,9,10	6
CO3	Differentiate wired and wireless computer networks	R/U/A	1,2,3,9,10	10
CO4	Analyse TCP/IP and their protocols.	U/A	1,2,3,9,10	10
CO5	Recognize the different internet devices and their functions.	R/U/A	1,2,3,4,9,10	8
CO6	Identify the basic security threats of a network.	R/U/A	1,2,3,4,5,7,9,10	7
Total sessions including 4 hrs student activity				52

Legends: PO-Program Outcome, CO-Course Outcome, CL-Cognitive Level, R-Remember, U-Understand, A-Apply

Course-PO Attainment Matrix

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
Data communication and networking	3	3	3	3	2	1	2	--	3	3
<p style="text-align: center;">Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed.</p> <p>Method is to relate the level of PO with the number of hours devoted to the COs which address the given PO.</p> <p>If $\geq 40\%$ of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3</p> <p>If 25 to 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 2</p> <p>If 5 to 25% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 1</p> <p>If $< 5\%$ of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed.</p>										

Course content and pattern of marks for SEE

Unit No	Unit Name	Hour	Questions For SEE			Marks Weightage	Weightage (%)
			R	U	A		
1	Introduction to data communication and networks	07	05	05	10	20	15
2	Networking protocols and OSI model	07	05	05	10	20	15
3	Computer networks	11	05	10	15	30	20
4	TCP/IP	11	05	10	15	30	20
5	Communication protocols	08	05	10	10	20	15
6	Internet devices and protocols	08	05	05	10	25	15
Total		52	30	45	70	145	100

Legend: R- Remember, U-Understand A-Application

Course Content

Unit-1: Introduction to data communication and networks

7 Hours

Data communication-data representation, data flow, components. Definition of node, link, branch, network, network criteria. **Physical structures**-types of connection, working of different network topologies, network configuration and their advantages, concepts and comparison of LAN, MAN, WAN. Switching - concepts of circuit switching, packet switching & message switching and their applications.

Unit-2: Networking protocols and OSI model

7 Hours

Protocol layering-Scenarios, principles. Logical connection-connection oriented and connection less. Protocols in computer communications, **OSI reference model** - functions of all layers. **Data link control**- concept of framing, flow control and error control.**MAC protocol**- addressing mechanism. Concept of encapsulation and decapsulation.

Unit-3: Computer Networks**11 Hours**

Local area network-wired LANs features and classification. **Ethernet**- properties, frame format (IEEE 802.3), addressing, simple problems on addressing. **virtual LAN**- working, advantages. **Access method**–CSMA/CD. **Token passing LANS**- properties, token bus maintenance and working. Token ring properties, mechanism. **FDDI** –operation, self healing, **Wireless LANS** - features, Bluetooth architecture (IEEE 802.15). Basic concepts of WIMAX, cellular telephony, satellite networks.

Unit-4: TCP/IP**11 Hours**

TCP/IP-Model, protocols layers, INTERNET Address, logical address, Physical address, UDP/IP Datagram Format, classes of IP address, Dotted Decimal notation of IP address, basics of IPv4 and IPv6, simple problems on addressing. **Address mapping** –static mapping, dynamic mapping. **ARP**- need, methods, need of RARP and ICMP. Definition of fragmentation and reassembly. Features of TCP, relationship between TCP and IP.

Unit-5: Communication protocols**8 Hours**

Concepts of Ports and Sockets. **Domain Name System (DNS)** -name system, name space, working of DNS server. **Email**- architecture, protocols, advantages of IMAP. Basics of FTP, **FTP Connections** - Control and Data transfer Connection. **Frame relay**- Need, Working of frame relay, **ATM**- Architecture, characteristics.

Unit-6: Internet devices and protocols**8 Hours**

Internetworking-need and concept. **Connecting Devices**-discussion on Routers, switches, repeaters, Bridges, Switches and Gateways. **Ways of accessing the internet**- Dial-up access, SLIP, PPP, leased lines, DSL basics, internet access by cable. **Modems**-basics, types, operation, applications. **Network security**-basics of threats and fire wall.

References

1. *Data Communications and Networks*- 2nd edition -Achyut S Godbole- and Atul Kahate Tata McGraw-Hill
2. *Data Communications & Networking* – 5th Edition- B A Forouzan- Tata McGraw-Hill.
3. *Computer Networks*- 4th Edition- Andrew S Tanenbaum- Pearson-Prentice Hall
4. *Computer Networking* - James F. Kurose & Keith W. Ross- PEARSON
5. *Computer Communications and Networking Technologies* - Michael A. Gallo & William M. Hancock- BROOKS&COLE
6. *Computer Networks and Internets* -Douglas E. Comer- PEARSON.
7. *Data and Computer Communications*- Eighth Edition- William Stallings- Pearson Education.
8. Refer the course contents at NPTEL website of IIT Khargapur of course- Communication Networks and Switching.
9. *Network Security Bible*, 2nd edition, Eric Cole, Wiley Publishers.
10. *Data communication and networks* –James Irvine and David Harley- Publishers: Wiley India.

Course Delivery

The course will be delivered through lectures, presentations and support of modern tools. Activities are off-class.

Course Assessment and Evaluation Scheme

Master Scheme

Assessment Method	What		To Whom	Assessment mode /Frequency /timing	Max. Marks	Evidence Collected	Course Outcomes
Direct assessment	CIE	IA	Students	Three tests ⁺	20	Blue Books	1 to 6
				Activity*	05	Activity Sheets	1 to 6
	SEE	End exam		End of the course	100	Answer Scripts at BTE	1 to 6
				Total	125		
Indirect assessment	Student feedback on course		Students	Middle of the Course	Nil	Feedback Forms	1 to 3 Delivery of course
	End of course survey			End of the Course	Nil	Questionnaires	1 to 6 Effectiveness of delivery instructions & assessment methods

Legends: CIE-Continuous Internal Evaluation, SEE- Semester End-exam Evaluation

⁺ Every I.A. test shall be conducted for 20 marks. Average of three tests, by rounding off any fractional part thereof to next higher integer, shall be considered for IA.

*Students should do activity as per the list of suggested activities/ similar activities with prior approval of the teacher. Activity process must be initiated well in advance so that it can be completed well before the end of the term.

Questions for CIE and SEE will be designed to evaluate the various CLs as per the weightage shown in the following table.

Sl. No.	Cognitive Levels (CL)	Weightage (%)
1	Remembering	20
2	Understanding	30
3	Applying	50
Total		100

Continuous Internal Evaluation (CIE) pattern

(i) Student Activity (5 marks)

The following student activities or similar activities can be assigned for assessing CIE/IA marks

Sl. No.	Activity
---------	----------

- 1 Prepare a report on the Components of Network used in Computer Lab or browsing centre or cellular network stations.
- 2 Prepare a report on ISDN or web applications.
- 3 Make a hand-written report on applications on internet devices that are observed in your surroundings.
- 4 Prepare a report on various standards organization of data communication and networking.

Execution Mode

1. Maximum of 4 students in each batch and one activity per batch.
2. All the above activities need to be distributed evenly to the students.
3. Write qualitative report of 4-6 pages; one report per batch.
4. Activities can be carried out off-class; demonstrations/presentations can be in lab sessions.
5. Teacher is expected to observe and record the progress of students' activities
6. Assessment shall be made based on quality of activity in accordance with the following rubrics table

(ii) Model of rubrics for assessing student activity

Dimension	Scale					Marks (Example)
	1 Unsatisfactory	2 Developing	3 Satisfactory	4 Good	5 Exemplary	
1. Research and gathering information	Does not collect information relate to topic	Collects very limited information, some relate to topic	Collects basic information, most refer to the topic	Collects more information, most refer to the topic	Collects a great deals of information, all refer to the topic	3
2. Full-fills team roles and duties	Does not perform any duties assigned to the team role	Performs very little duties	Performs nearly all duties	Performs almost all duties	Performs all duties of assigned team roles	2
3. Shares work equality	Always relies on others to do the work	Rarely does the assigned work, often needs reminding	Usually does the assigned work, rarely needs reminding	Always does the assigned work, rarely needs reminding.	Always does the assigned work, without needing reminding	5
4. Listen to other team mates	Is always talking, never allows anyone to else to speak	Usually does most of the talking, rarely allows others to speak	Listens, but sometimes talk too much,	Listens and talks a little more than needed.	Listens and talks a fare amount	3
Total marks						ceil(13/4)= 4

(iii) CIE/IA Tests (20 Marks)

Three tests have to be conducted, during specified schedule, in accordance with the test pattern given below and their average-marks shall be considered for CIE/IA.

(iv) Format of CIE/IA test question paper

CIE Question Paper					
Institution Name and Code					
Course Co-ordinator/Teacher					
<i>Program Name</i>		<i>Test No.</i>		<i>Units</i>	
<i>Class/Sem</i>		<i>Date</i>		<i>CL</i>	
<i>Course Name</i>		<i>Time</i>		<i>COs</i>	
<i>Course Code</i>		<i>Max. Marks</i>		<i>POs</i>	
Note to students: Answer all questions					
Question No.	Question	Marks	CL	CO	PO
1					
2					
3					
4					

Legends: PO-Program Outcome, CO-Course outcome, CL-Cognitive Level, R-Remember, U-Understand, A-Apply

Note: Internal choice may be given in each CO at the same cognitive level (CL).

(v) Model question paper for CIE

CIE Question Paper					
Institution Name and Code					
Course Co-ordinator/Teacher					
<i>Program Name</i>	Electronics and Communication	<i>Test No.</i>	1	<i>Units</i>	1 & 2
<i>Class/Sem</i>	4 th Sem	<i>Date</i>	1/1/2017	<i>CL</i>	R/U/A
<i>Course Name</i>	Data Communication and Networking	<i>Time</i>	10-11AM	<i>COs</i>	1 & 2
<i>Course Code</i>	15EC44T	<i>Max. Marks</i>	20	<i>POs</i>	1, 2 & 3
Note to students: Answer all questions					
No.	Question	Marks	CL	CO	PO
1	Define network. explain the parameters to meet network criteria	05	U/A	1	1,2,3
2	List the characteristics that data communication system depends upon.	05	R/A	1	1,2
3	Discuss the principles of protocol layering.	05	R	2	1,2
4	Explain different layers and their roles in protocols of computer communication.	05	A	2	1,2

Semester end-exam evaluation (SEE)

(i) End-exam question-paper pattern

Unit No.	Unit Name	Study Duration (Hrs.)	No. Questions for End-exam	
			5 marks Part - A	10 marks Part - B
1	Introduction To Data Communication And Networks	07	01	01
2	Networking Protocols And OSI Model	07	02	01
3	Computer Networks	11	02	02
4	TCP/IP	11	02	02
5	Communication protocols	08	01	02
6	Internetworking devices and Internet	08	01	02
	Total	52	09 (45 Marks)	10 (100 Marks)

(ii) Model question paper

Course Title : **Data Communication and Networking**

Course Code : **15EC44T**

Time : **3 Hrs**

Semester : **Fourth**

Max. Marks: **100**

Instructions: 1. Answer any **SIX** question from **Part A** (5x6=30 Marks)

2. Answer any **SEVEN** full questions from **Part B** (7x10=70 Marks)

Part A

1. Name the basic network topologies and cite an advantage of each type.
2. Explain MAC addressing mechanism
3. Show how the address 47:20:1B:2E:08:EE is sent out online.
4. List the features of wireless LANs?
5. Define mapping. Explain static mapping and dynamic mapping. (5)
6. Differentiate between port and socket.
7. Define address resolution .explain the different methods for obtaining the physical address based on IP address.
8. Draw a conceptual view of Internet domain name space.
9. Discuss the motives for internetworking.

Part B

1. a) Explain the components of data communication system.
b) Name are the factors that determine whether the communication system is LAN or WAN? .
2. Explain the different layers in OSI model.
3. a) Explain the need of protocol layering.
b) Differentiate between encapsulation and decapsulation.
4. a) Compare static and dynamic LANs? Why are static LANs not as popular as dynamic LANs?
b) Define and explain CSMA/CD.
5. a) Describe the main fields in Ethernet frame header.

- b) Explain why FDDI is called a self healing type of network?
- 6. a) Explain the mapping of TCP/IP protocols with the OSI model.(7)
- b) Explain the need of ICMP.
- 7. a) Explain the features of TCP.
- b) Compare ARP and RARP.
- 8. a) Explain the working of DNS server.(7)
- b) Explain the need for additional suffixes such as com, edu and gov?
- 9. Define spooling .discuss email architecture in brief along with its main components.
- 10.a)Describe how does router facilitate interconnection between two or more networks.
- b) Discuss the external and internal threats.

Institutional Activities

The following are suggested institutional activities, to be carried out at least one during the semester. The course teacher/coordinator is expected to maintain the relevant record (Containing, Activity name, Resource persons and their details, duration, venue, student feedback, etc) pertaining to Institutional activities.

Sl. No.	Activity
1	Organize Seminar, workshop or Lecture from experts on the modern trends in data communications and networking or modern network tools
2	Organize software workshop from experts on wire shark and analyse TCP/IP.

Model Question Bank

Note: The questions in the question bank are indicative but not exhaustive. Sub-questions on different CLs may be combined to frame 10-marks questions or 10-marks questions given here can be splitted into 5-marks questions if necessary keeping weightage of CLs approximately intact and adhering to SEE end-exam pattern.

Unit-1: Introduction to Data Communication and Networks 05 Marks

Remember

1. Name the basic network topologies and cite an advantage of each type.
2. List the characteristics that data communication system depends upon.
3. List the classification of standards organizations.

Understand

1. Define network .explain the parameters to meet network criteria
2. Define switching ,node, branch
3. Write a short note on standards.

Application

1. Compare LAN, WAN and MAN.
2. Differentiate between LAN and WAN.
3. List advantages of multi point connection over point to point one.
4. List are the factors that determine whether the a communication system is LAN or WAN?
5. Differentiate between ring and bus topology.

10 Marks

Understand

1. Briefly explain different forms of data.
2. Explain the different network topologies.
3. Explain the components of data communication system.
4. Explain the different switching techniques.

UNIT-2: Networking protocols and OSI model 05 Marks

Remember

1. Define frame. Write a note on error control and flow control.

Understand

1. Explain the need of protocol layering.
2. Explain MAC addressing mechanism.
3. Discuss the principles of protocol layering.
4. Differentiate between connection oriented and connection less.

Application

1. Discuss the role of network layer in OSI model.

10 Marks

Understand

1. Explain the different layers in OSI model.
2. Explain different layers and their roles in protocols of computer communication.
3. Explain the role played by presentation layer in handling data.
4. Differentiate between Encapsulation and encapsulation.

UNIT-3: Computer Networks 05 Marks

Remember

1. List the advantages of virtual LANs.
2. List the applications of satellite networks.
3. List the features of wireless LANs?

Understand

1. Write a note on WIMAX.
2. Explain the difference between a fixed WIMAX and mobile WIMAX.
3. Compare static and dynamic LANs

Application

1. Discuss the properties of Ethernet network.
2. Describe the purpose of transceiver and network interface card.
3. Show how the address 47:20:1B:2E:08:EE is sent out online.
4. Explain why are static LANs not as popular as dynamic LANs?
5. FDDI is called a self healing type of network, justify.
6. Write the hex decimal equivalent of the following address?
01011010 10000001 01010101 00010001 10101010 00011111

10 Marks

Understand

1. Explain the block diagram of cellular system.
2. Explain the architecture of Bluetooth
3. Describe the working of CSMA/CD
4. Explain the working of virtual LAN.

Application

1. Describe the main fields in Ethernet frame header.
1. Explain the working of a Token ring network. Demonstrate how is it different from Ethernet?

UNIT-4 TCP/IP

05 Marks

Remember

1. Define mapping. Explain static mapping and dynamic mapping.
2. Define address resolution .explain the different methods for obtaining the physical address based on IP address.

Understand

1. Explain how an IP address is designed to a host.
2. Explain the need of ICMP.
3. Explain fragmentation.
4. Compare ARP and RARP.
5. Differentiate between IPv4and IPv6.
6. Differentiate between TCP and UDP.
7. Differentiate between port and socket.

Application

1. Discuss the idea of port.
2. Describe the various fields in the IP datagram header.
3. Describe the three parts of an IP address.
4. Explain the purpose of Dotted Decimal notation of IP address.
5. Briefly discuss when to use TCP and when to use UDP.

10 Marks

Understand

1. Explain layered model of TCP/IP.
2. Explain the mapping of TCP/IP protocols with the OSI model.
3. Explain the features of TCP.

Application

1. Describe the various fields in UDP format.
2. Describe the various fields in TCP format.

UNIT-5 Communication protocols

05 Marks

Remember

1. Name the ATM layer and their functions.
2. Draw a conceptual view of Internet domain name space.
3. Define DNS and describe why it is required?

Understand

1. Explain the significance of a DNS server.
2. Differentiate IMAP with POP.
3. Explain the need of frame relay network.

Application

1. Discuss the FTP connection mechanism between the client and the server.
2. Discuss POP and SMTP.
3. Explain the need for additional suffixes such as com, edu and gov?
4. What is the purpose of FTP?
5. What are the specific purposes of the control connection?
6. Describe the characteristics of ATM.

10 Marks

Remember

1. Define spooling .discuss email architecture in brief along with its main components.

Understand

1. Explain the working of DNS server.
2. Briefly explain the working of frame relay .

UNIT-6 Internetworking devices and internet

05 Marks

Remember**Understand**

1. Explain universal service
2. Explain how does router facilitate interconnection between two or more networks
3. Explain is bridge and its functions
4. Explain working of router
5. Explain the working a gateway work
6. Compare SLIP and PPP with definitions
7. Explain leased line and its purposes
8. Explain firewall.

Application

1. Discuss the motives for internetworking.
2. Summarize of internetworking devices.


10 Marks

Application

1. Discuss the different type's modems.
2. Discuss the external and internal threats.

End

Government of Karnataka
Department of Technical Education
Board of Technical Examinations, Bangalore

	Course Title: PROFESSIONAL PRACTICES		
	Scheme (L:T:P) : 0:2:4	Total Contact Hours: 78	Course Code: 15EC45P
	Type of Course: Assignment Group talk and practice	Credit : 03	Core/ Elective: Core(practice)

Prerequisites: Enthusiasm to Explore New things by taking individual tasks and acquires skills from participating in group activities.

Course Objectives:

Overall professional development of diploma in Electronics & Communication engineering is the need of the day for enabling them to sustain in competitive global environment. Professional development of Diploma engineering students is to be done by exposing them to various simulative situations in the industries. This can be achieved by inculcating attitude to face the problems, get alternative solutions and validation of the selected alternatives. This is achieved by involving students in activities such as inviting experts from various industries for sharing their experiences, arranging industrial visits, seminars etc.

On successful completion of the course, the students will be able to:

Course Outcome	
CO1	Ability to acquire knowledge of contemporary issues and relate the advancements in Electronics & Communication engineering domain in a global, economic, environmental, and societal context.
CO2	Aware of current Electronics & Communication engineering professional practice issues and have an appreciation of the broader, global, societal, economic and environmental aspects.
CO3	Analyze the current situations, discuss & disseminate about advancements in related profession including societal, environmental and ethical responsibilities of an engineer.
CO4	Develop individual confidence to handle various engineering assignments and expose themselves to acquire life skills to meet societal challenges
CO5	Enhancing the employability skills and to increase his ability to engage in, life-long learning, Usage of modern tools by undergoing industrial visits

Course Outcome		CL	Activities linked	Linked PO	Teaching Hrs
CO1	Ability to acquire knowledge of contemporary issues and relate the advancements in Electronics & Communication engineering domain in a global, economic, environmental, and societal context.	R/U/A	UNIT-1	1,2,4,5,6,7,8,9,10	15
CO2	Aware of current Electronics & Communication engineering professional practice issues and has an appreciation of the broader in global, societal, economic, and environmental aspects.	R/U/A	UNIT-2	1,2,4,5,6,7,8,9,10	15
CO3	Analyze the current situations, discuss & disseminate about advancements in related profession including societal, environmental and ethical responsibilities of an engineer.	R/U/A	UNIT-3	1,2,4,5,6,7,8,9,10	15
CO4	Develop individual confidence to handle various engineering assignments and expose themselves to acquire life skills to meet societal challenges	R/U/A	UNIT-4	1,2,4,5,6,7,8,9,10	15
CO5	Enhancing the employability skills and to increase his ability to engage in, life-long learning, Usage of modern tools by undergoing industrial visits	R/U/A	UNIT-5	1,2,4,5,6,7,8,9,10	18
				Total sessions	78

COURSE-PO ATTAINMENT MATRIX

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
PROFESSIONAL PRACTICES	3	3	--	3	3	3	3	3	3	3
<p>Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed.</p> <p>Method is to relate the level of PO with the number of hours devoted to the COs which address the given PO.</p> <p>If $\geq 40\%$ of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3</p> <p>If 25 to 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 2</p> <p>If 5 to 25% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 1</p> <p>If $< 5\%$ of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed.</p>										

UNIT-1. Information Search and Data collection:**15HRS**

Information search can be done through manufacturer's catalogue, websites, magazines; books etc. *Following topics are suggested.*

- 3G & 4G mobile communications.
- LTE (**Long-Term Evolution**) Technology
- WCDMA
- Wi-fi
- Hi-hi
- Blue-Ray Technology
- E-waste disposal
- VOIP
- Artificial Intelligence
- Data Compression Techniques
- Hi Speed Networks
- Embedded Systems
- Ipad and Ipad
- Biometric Systems
- PCB designing using softwares
- Free and Open Source Softwares (FOSS)
- Laser Applications
- Automotive Electronics
- Surface Mount Technology.
- RTOS
- Quality Certification Standards
- Pen PC
- CCD cameras
- Thermal Imaging

Note: topic may be any other advanced technology.

Method for conducting Graded activities

1. The student should individually select the topic, and search the information related to topic.
2. The report is strictly hand written document to have knowledge of precise writing and report making based on data collection
3. Carry out class room presentation.

UNIT-2. Guest Lecturers: To be organized from any two of the following areas 15 HRS

Experts / Professionals from different field/industries are invited to deliver lectures at least TWO sessions in a semester. The topics may be selected by the teacher /industry expert to develop required skills.

Note1: The ISTE student chapter/CCTEK/ Institute of engineers (Institute chapter)/ student clubs of polytechnic may be used as platform to conduct this activity.

1. Pollution control.
2. E-Waste management.
3. Fire Fighting / Safety Precautions and First aids.
4. Computer Networking and Security.
5. Career opportunities,
6. Yoga Meditation,

7. Aids awareness and health awareness.
8. Safety Engineering and Waste elimination.
9. Interview Techniques.
10. Programmable logic controllers.
11. Cloud computing.
12. Safety awareness on driving.
13. Program on Personality development.
14. Career guidance program

Note2: Topic may be chosen from the above or any relevant. However the decision of Program co-ordinator is final.

Method for conducting Guest lectures

1. The teacher/ISTE student chapter convener should fix up the date for guest lecture.
2. The HOD of the department should chair the event.
3. The students of class allowed participating in the session.
4. Watch the talk and make the brief hand written report on the guest lecture delivered by each student as a part of Term work.
5. Make Audio/visual record of the guest lecture by using any smart devices.
6. Opportunity should be provided for students for live Interaction with experts and record it on any one smart device.

UNIT-3. Group Discussion: (One topic)

15HRS

The students shall discuss in group of six students .Some of the suggested topics are

1. Polythene bags must be banned!
2. Do we really need smart cities?
3. E – Books or Printed books – what's your choice?
4. Is Face book for the attention – seeking and lazy people?
5. Globalization and its impact on Indian Culture.
6. Analytically evaluate the solutions to traffic problems
7. Global warming is caused more by developed countries
8. Rain forests help in maintaining the earth's ecosystem
9. Reservation for women would help the society
10. How to deal with terrorism
11. Water resources should be nationalized
12. Daughters are more caring than sons
13. NGOs - Do they serve people's interests?
14. Managers are born, not trained
15. Managerial skills learnt in the classroom
16. Women are good managers
17. India's growth rate is bridging gap between rich and poor.
18. Nuclear power is a safe source of energy
19. Electronic media vs. print media
20. Corruption is the price we pay for democracy
21. Multinational corporations: Are they devils in disguise?
22. Advertising is a waste of resources.
23. Privatization will lead to less corruption.
24. China market - a threat to Indian market
25. Technology Creates Income Disparities

26. India should be reorganized into smaller states.
27. Rising petrol prices - Govt. can control?
28. Smaller businesses and start-ups have more scope
29. Developing countries need trade, not aid.
30. Business and Ethics do not go together
31. Performance based bonuses for government employees should be welcomed
32. Depreciation of Indian Rupee has only negative impact on the economy
33. Gold: Best investment or a bursting bubble?
34. Freedom of press should exist
35. India needs a strong dictator
36. Media is a mixed blessing/How ethical is media?
37. Computer viruses are good
38. India should practice "Swadeshi"
39. The government should stop funding IIT's and IIM's
40. Food Bill - Is it really something India needs?
41. Will India really be the superpower of 21st century?
42. Quality is a myth in India.
43. China - A threat to India?
44. Indian villages - our strength or our weakness?
45. Mobile phones - requirement of the day.
46. Cursing the weather is bad farming
47. If you want peace, prepare for war
48. Education is a progressive way of discovering your ignorance.
49. Beauty contests degrade womanhood
50. If you are not a part of the solution, you are part of the problem
51. Examinations - has it killed education?
52. The medium of teaching in schools should be English
53. A room without books is like a body without soul.
54. Educated Indians lack national commitment.
55. E-Learning is good for the education system and society

Methodology for conducting Group discussion/Seminar

1. The teacher will allot a topic for a group of six students
2. The teacher should give an introductory talk on Ways and rules to carry out group discussion
3. The students should ask to show interest with others and work effectively with them to meet common objective. The teacher should provide tips to accept feedback in a constructive and considerate way and how to handle frustrations in group, while discussion.
4. The placement officer and any other senior faculty of the institute/ HOD of other department should be invited and they should act as observing members, apart from teacher
5. The teacher should fix up the time duration for initiating and conducting the activity

Documentation to be produced for validation

- Hand written document on minutes of discussion, description of the topic discussed
- Record the few minutes of discussion by smart device

UNIT-4. Individual Assignments and Life skills**15HRS**

The students will perform ANY ONE of the following activities individually (other similar activities may be considered) in both the sections.

A. Individual assignments

1. Suggest individual activities or encourage students to take up desired activity.

B. Life skills

1. Conduct aptitude, general knowledge test, IQ test, Solve Puzzles.
2. Set the goal for personal development.
3. Develop good habits to overcome stress.

Methodology for conducting activity

1. The teacher will assign a topic for individual student; give sufficient time to complete the task. Ask the student to submit an hand written report.
2. The teacher should conduct any one specified life skill activity with local NGO/ placement cell/ISTE student chapter/CCTEK/ NSS unit of the institute. The student should present his/her experiences in a class and make report.

UNIT-5. Industrial Visits**18 HRS**

Structured industrial visits be arranged and report of the same shall be submitted by the individual student, to form a part of the term work. Following are the suggested types of Industries/ Fields.

Note: One Industrial visit is arranged per practical batch of students.

Methodology

1. The subject teacher(s) have liberty to select nearby organization/industry of local vicinity with prior approval of principal of the institute
2. Arrange the nearby visit and Prepare a word processing report of the visit including details observations made, Details of visit should be mentioned with date , place etc

Course Delivery:

The course will be delivered through discussions and activities

Course Assessment and Evaluation Scheme:

Direct Assess ment meth	What		To whom	When/Where (Frequency in the course)	Max Marks	Evidence collected	Course outcomes
	CIE	IA					
			Students	Each activities @5 marks each	25	Report	1,2,3,4,5
				End of the course	50	Answer scripts at BTE	1,2,3,4,5
Indirect Assessment	Student Feedback on course		Students	Middle of the course	nil	Feedback forms	1,2,3 Delivery of course
	End of Course Survey			End of the course	nil	Questionnaires	1,2,3,4,5 Effectiveness of Delivery of instructions & Assessment Methods

Rubrics to be devised appropriately by the concerned faculty to assess Student activities.

• **MODEL OF RUBRICS /CRITERIA FOR ASSESSING STUDENT ACTIVITY**

RUBRICS MODEL

RUBRICS FOR ACTIVITY(5 Marks)						
Dimension	Unsatisfactory	Developing	Satisfactory	Good	Exemplary	Student Score
	1	2	3	4	5	
Collection of data	Does not collect any information relating to the topic	Collects very limited information; some relate to the topic	Collect much information; but very limited relate to the topic	Collects some basic information; most refer to the topic	Collects a great deal of information; all refer to the topic	Ex: 4
Fulfill team's roles & duties	Does not perform any duties assigned to the team role	Performs very little duties but unreliable.	Performs very little duties	Performs nearly all duties	Performs all duties of assigned team roles	5
Shares work equally	Always relies on others to do the work	Rarely does the assigned work; often needs reminding	Usually does the assigned work; rarely needs reminding	Normally does the assigned work	Always does the assigned work without having to be reminded.	3
Listen to other Team mates	Is always talking; never allows anyone else to speak	Usually does most of the talking; rarely allows others to speak	Talks good; but never show interest in listening others	Listens, but sometimes talk too much	Listens and speaks a fair amount	2
Average / Total marks=(4+5+3+2)/4=14/4=3.5=4						

Note: This is only an example. Appropriate rubrics/criteria may be devised by the concerned faculty (Course Coordinator) for assessing the given activity.

Note to IA verifier: The following documents to be verified by CIE verifier at the end of semester

1. Student activities report for 25 marks
2. Student feedback on course regarding Effectiveness of Delivery of instructions & Assessment Methods.

For end examination:

1. **Note for examiners :** The records of the activities should be preserved in the department for minimum three years and the examiner should verify these records to prevent duplication of the activity.

Scheme of Valuation for End Examination

Serial no	Description	Marks
1	Report on Information Search and Data collection	10
2	Document on Guest Lecturer by experts	10
3	Recording of Group discussions made by any smart devices	10
4	Report on Individual assignment/ Life skill activity recorded	10
5	Report on Industrial visit	10
	TOTAL	50

MODEL QUESTION PAPER

4TH - Semester E&CE Diploma Examination

Course Title: **PROFESSIONAL PRACTICES**

Time: **3 Hours**]

[Max Marks: **50**

- | | |
|---|----------|
| 1. Write brief note on information searched and data collected activity | 10marks |
| 2. Give brief explanation about knowledge acquired by you during the guest lecture | 10 marks |
| 3. Write the conclusion of the topic given for the group discussion | 10 marks |
| 4. Write brief note on individual assignment performed and information gathered and data collected activity | 10marks |
| 5. Write the sequence of processing followed in the industry/work shop You have visited | 10 marks |

Note: The marks should be awarded on the basis of Reports/Documents submitted by the student.

Government of Karnataka
Department of Technical Education
Board of Technical Examinations, Bengaluru

Course Title	: Microcontroller Lab	Course Code	: 15EC46P
Credits	: 3 Credits	Semester	: 4
Teaching Scheme in Hrs (L:T:P)	: 0:2:4	Course Group	: Core
Type of course	: Tutorial + Practical	Total Contact Hours	: 78
CIE	: 25 Marks	SEE	: 50 Marks

Prerequisites

Knowledge of instruction set of 8051 and exposure to C programming language

Course Objectives

Imparting on hands on exposure to the students in the usage of development tools and to make them proficient in building 8051 based applications.

Course Outcomes

At the end of the course, the students will be able to obtain the following COs

Course Outcome		CL	Experiments linked	Linked PO	Teaching Hrs
CO1	Select and use a standard IDE for editing, compiling, debugging and simulation of ALP/C programs (program development).	<i>R/U/A</i>	Unit -1, Program 1	1,2,4,10	06
CO2	Adjudicate the right usage of assembly language instructions and Embedded C features.	<i>U/A</i>	Unit -1, Program 2 to 10	1,2,3,4,10	33
CO3	Write programs for simple I/O, delay generation and standard interfaces.	<i>U/A</i>	Unit -1, Program 11 to 16	1,2,3,4,10	24
CO4	Adapt the existing code for development of simple real-world applications-student activity	<i>U/A</i>	Unit-2/ Project activity	1,2,3,4,5,8,9,10	09
Total sessions include two tests					78

Course-PO Attainment Matrix

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
Microcontroller Lab	3	3	3	3	1	--	--	1	1	3

Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed.

Method is to relate the level of PO with the number of hours devoted to the COs which address the given PO.

If $\geq 40\%$ of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3

If 25 to 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 2

If 5 to 25% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 1

If $< 5\%$ of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed.

Course Contents

Unit-1: Tutorials and Graded Exercises

69 Hours

Sl. No.	Topic/Exercises	Duration (Hr)
Practicing Exercise		
1	Identification of program development tools and familiarization of program development using such tools.	6
Basic experiments (Use ALP and embedded C on simulators or kits)		
2	Data movement: (a) Move a block of data within internal RAM (b) Exchange a block of data between internal RAM and external memory	3
3	Arithmetic operations: (a) Evaluate simple arithmetic expression such as $y = (((5*2)-(4+1))/3) \% 2$. (b) Addition of three 8-bit BCD numbers to result in BCD form.	3
4	Logical operations: (a) Evaluate simple logical expression such as $Y = a \& b \mid c \wedge d$ where a, b, c and d are 8-bit data (b) Rotation or shift operations on 16-bit data (c) Convert data to even-parity in a block of internal RAM	6
5	Code conversions (a) Packed BCD to unpacked BCD and vice-versa (b) BCD to binary and vice-versa (b) BCD to ASCII and vice-versa	6
6	Program to search a given 8-bit number in an array of N numbers	3
7	Program to sort N 8-bit numbers.	3
8	Program to count the number of ones and zeros in the data saved in two consecutive memory locations	3
9	Program to clear all the bytes (stored in internal RAM) which have odd-parity	3
10	Program to toggle a particular bit in the internal RAM with the delay of N ms given the clock frequency f MHz with the use of delay subroutine.	3
Interfacing experiments (using embedded C and microcontroller boards)		
11	Program to toggle the LED with tone using push-button switch.	3
12	Program to display the value of analog voltage interfacing ADC or any digit pressed in an hex-key pad on LCD display	3
13	Program to control direction and speed of a stepper motor.	3

14	Program to generate DTMF telephone tones; use push-button switch to trigger the tone.	6
15	Program to generate sine, rectangular and triangular wave-forms.	6
16	Program to control traffic lights.	3
Two Internal Assessment Tests		6
Total		69

Unit – 2: Project/Student Activities [CIE- 05 Marks] 9 Hours

Sl. No.	Activity	Duration (Hrs)
1	Three open-ended experiments of assembly language programs/embedded C other than programs 2 to 10 mentioned above are to be assigned by the teacher (Student is expected to solve and execute/simulate independently).	09

References

1. *The 8051 Microcontroller & Embedded systems using assembly and C (2nd Edition)* –M.A.Mazidi , J.C. Mazidi & R.D.McKinlay ISBN: 81-317-1026-2
2. *The 8051 Microcontroller(4th Edition)*- MacKenzie , ISBN:81-317-2018-7
3. *The 8051 Microcontroller(1st Edition)* – Dr.Uma Rao & Andhe Paallavi, ISBN: 81-317-3252-5
4. *Microcontrollers & applications*, Ramani Kalpathi, & Ganesh Raja , ISBN: 81-888-4918-9
5. *Embedded C* - Michael .J.Pont - Pearson Education -2002 ISBN 0 201 79523 X

Course Delivery

The course will be normally delivered through two-hour tutorials and four-hour hands-on practice per week; hands-on practice shall include basic experiments and interfacing exercises. Normally, one-hour tutorial followed by two-hour hands-on practice is recommended in each class. Tutorial shall be imparted before the conduction of the experiment. However, activities are carried-out off class and demonstration/presentation can be in lab sessions.

Course Assessment and Evaluation Scheme

Master Scheme

Assessment Method	What		To Whom	Assessment mode /Frequency /timing	Max. Marks	Evidence Collected	Course Outcomes
Direct assessment	CIE	IA	Students	Two tests ⁺	10	Blue Books	1 to 4
				Record [@]	10	Record Book	1 to 4
				Activity [*]	05	Report/Sheets	1 to 4
	SEE	End exam		End of the course	50	Answer Scripts at BTE	1 to 4
				Total	75		
Indirect assessment	Student feedback on course		Students	Middle of the Course	Nil	Feedback Forms	1 to 2 Delivery of course
	End of course survey			End of the Course	Nil	Questionnaires	1 to 4 Effectiveness of delivery instructions & assessment methods

Legends: CIE-Continuous Internal Evaluation, SEE- Semester End-exam Evaluation

⁺ Every I.A. test shall be conducted as per SEE scheme of valuation. However, scored marks will be scaled down to 10. Average of two tests, by rounding off any fractional part thereof to next higher integer, shall be considered for IA.

^{*} Students should do activity as per the list of suggested activities/ similar activities with prior approval of the teacher. Activity process must be initiated well in advance so that it can be completed well before the end of the term.

[@] Record Writing: Average of marks allotted for all experiments shall be considered; fractional part of average shall be rounded-off to next higher integer.

Composition of CLs

Sl. No.	Cognitive Levels (CL)	Weightage (%)
1	Remembering	20
2	Understanding	30
3	Applying	50
Total		100

Continuous Internal Evaluation (CIE) pattern

(i) Student Activity (5 marks)

The student activities in Unit-2 or similar activities can be assigned

Execution Notes:

1. Every batch of two students is assigned three open-ended programs by the teacher; students can also choose any other similar /relevant programs with prior approval from the concerned teacher.
2. Teacher is expected to observe and record the progress of students' activities
3. Assessment is made based on quality of work as prescribed by the following **rubrics** table

(ii) Model of rubrics for assessing student activity (for every student)

Dimension	Scale					Marks (Example)
	1 Unsatisfactory	2 Developing	3 Satisfactory	4 Good	5 Exemplary	
1. Research and gathering information	Does not collect information relate to topic	Collects very limited information, some relate to topic	Collects basic information, most refer to the topic	Collects more information, most refer to the topic	Collects a great deals of information, all refer to the topic	3
2. Full-fills team roles and duties	Does not perform any duties assigned to the team role	Performs very little duties	Performs nearly all duties	Performs almost all duties	Performs all duties of assigned team roles	2
3. Shares work equality	Always relies on others to do the work	Rarely does the assigned work, often needs reminding	Usually does the assigned work, rarely needs reminding	Always does the assigned work, rarely needs reminding.	Always does the assigned work, without needing reminding	5
4. Listen to other team mates	Is always talking, never allows anyone to else to speak	Usually does most of the talking, rarely allows others to speak	Listens, but sometimes talk too much,	Listens and talks a little more than needed.	Listens and talks a fare amount	3
Total marks						ceil(13/4)= 4

(iii) CIE/IA Tests (10 Marks)

Two tests shall be conducted in accordance with SEE pattern and the marks shall be scaled down to 10. Average of two tests, rounding-off any fractional part thereof to next higher integer, shall be considered for CIE/IA.

(iv) Record Evaluation (10 Marks)

Every experiment shall be given marks, in the scale of 10, after its conduction based on student's performance and quality of write-up. Average of them, by rounding-off any fractional part thereof to next higher integer, shall be considered for CIE/IA.

Semester End-exam Evaluation (SEE) Scheme

Sl. No.	Scheme	Max. Marks
1	Writing program for one basic experiment	05
2	Writing algorithm (20% weightage) and program (80% weightage) for one interfacing experiment	15
3	Execution/Simulation of the basic experiment program assigned in 1	10
4	Execution/Implementation of the interfacing program assigned in 2	10
5	Viva-voce	10
Total		50
Note:		

1. Candidate is expected submit the laboratory record during examination.
2. Student shall be allowed to execute the program even if she/he unable to write the algorithm or procedure or steps

End

Government of Karnataka
Department of Technical Education
Board of Technical Examinations, Bengaluru

Course Title: DIGITAL COMMUNICATION & NETWORKING LAB	Course Code : 15EC47P
Semester : Fourth	Credits : 4
Teaching Scheme in Hr. (L:T:P) : 0:2:4	Course Group : Core
Type of course : Tutorial + Practical	Total Contact Hours : 78
CIE : 25 Marks	SEE : 50 Marks

Prerequisites

Basic Knowledge of analog communication, digital electronics, digital communication and data communication networks.

Course Objectives

Understand, analyze and evaluate the working/operation of digital communication and networking elements and applications.

Course Outcomes

On successful completion of the course, the students will be able to attain the following COs

Course Outcome		CL	Experiments linked	Linked PO	Teaching Hrs
CO1	Understand and analyze sampling, multiplexing.	<i>U/A</i>	Unit-1: E1-2	1,2,3,4,	06
CO2	Analyze digital modulation and demodulation techniques.	<i>R/U/A</i>	Unit-1: E3-7	1,2,3,4	21
CO3	Demonstrate OFC characteristics & applications.	<i>R/U/A</i>	Unit-1: E8-9	1,2,3,4,6,7,9,10	06
CO4	Install and test computer networking and sharing of resources.	<i>U/A</i>	Unit-1: E10-15	1,2,3,4,7,8,9,10	24
CO5	Setup Internet using modem, PSTN	<i>U/A</i>	Unit -1: E16	1,2,3,4,8,9,10	06
CO6	Student Project Activities	<i>U/A</i>	Unit -2	1,2,3,4,5,6,7,8,9,10	09
Two IA/CIE Tests					06
Total					78

Course-PO Attainment Matrix

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
Digital Communication & Networking Lab	3	3	3	3	1	1	3	3	3	3
<p>Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed.</p> <p>Method is to relate the level of PO with the number of hours devoted to the COs which address the given PO.</p> <p>If $\geq 40\%$ of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3</p> <p>If 25 to 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 2</p> <p>If 5 to 25% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 1</p> <p>If $< 5\%$ of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed.</p>										

Course Contents

Unit-1: Tutorials and Graded Exercises

69 Hours

Sl. No.	Topic/Exercises	Duration (Hr)
Part-A: Digital Communication Experiments		
1	Prove sampling theorem for low-pass signals.	3
2	Conduct an experiment to study the effect of aliasing	3
3	Perform an experiment to study Pulse Code Modulation and Demodulation.	3
4	Generation of Delta modulated signal and adaptive delta modulation signal	6
5	Generation and detect of BASK signal.	3
6	Generation and detect of BFSK signal	3
7	Perform an experiment to generate and detect BPSK signal using trainer kit.	6
8	Demonstrate TDM using Fiber Communication System.	3
9	Demonstrate PC to PC communication using Fiber Optic Digital Link.	3

Part-B: Data Communication and Networking experiments		
10	Exercise on crimping Network Cable & Testing using Cable Tester	6
11	Configuration of TCP/IP Protocols settings in Windows or Linux.	3
12	Install a peer to peer network and test with Net meeting.	3
13	Install a network between 3 or more computers using network switch and test for sharing resources	3
14	Establish LAN between Linux & Windows Systems & Share Printer	3
15	Install a Wireless network using Access Point and Wireless Network card between 3 or more computers and Test by Sharing a Printer	6
16	Setup Internet using modem, PSTN Line/WLL/Broad Band and Internet account share internet through LAN	6
Two Internal Assessment Tests		6
Total		69

Unit – 2: Project /Student Activities [CIE- 05 Marks]

9 Hours

Sl. No.	Activity	Duration (Hrs)
1	Design and implement a digital communication link employing ASK or FSK.	09
2	Demonstration and report on functioning of remote PC access through Internet.	

References

1. *Electronics laboratory primer*, S. Poorna Chandra, B.Sasikala, S. Chand Technical Publication. ISBN 81-219-2459-6
2. *Digital Communications*, Dr. K.N.Hari Bhat and Dr.D.Ganesh Rao, III Edition, Sanguine Technical Publishers.
3. <https://www.youtube.com/watch?v=Wh9knsYSodI>
4. <https://www.youtube.com/watch?v=pIIlBINW7sOo>
5. <https://www.youtube.com/watch?v=YmPziPfaByw>
6. <https://www.youtube.com/watch?v=Q3tpT1aMZKY>
7. <https://www.youtube.com/watch?v=jXGo4hIZWAY>
8. *Computer Networks- 5th Edition- Andrew S Tanenbaum- Pearson-Prentice Hall*
9. www.windowsnetworking.com
10. www.networktutorials.info

Course Delivery

The course will be normally delivered through two-hour tutorials and four-hour hands-on practice per week. Normally, one-hour tutorial followed by two-hour hands-on practice is recommended in each class. Tutorial shall be imparted before the conduction of the experiment. However, activities are carried-out off class and demonstration/presentation can be in lab sessions.

Course Assessment and Evaluation Scheme

Master Scheme

Assessment Method	What		To Whom	Assessment mode /Frequency /timing	Max. Marks	Evidence Collected	Course Outcomes
Direct assessment	CIE	IA	Students	Two tests ⁺	10	Blue Books	1 to 6
				Record [@]	10	Record Book	1 to 6
				Activity [*]	05	Report/Sheets	1 to 6
	SEE	End exam		End of the course	50	Answer Scripts at BTE	1 to 6
				Total	75		
Indirect assessment	Student feedback on course		Students	Middle of the Course	Nil	Feedback Forms	1 to 3 Delivery of course
	End of course survey			End of the Course	Nil	Questionnaires	1 to 6 Effectiveness of delivery instructions & assessment methods

Legends: CIE-Continuous Internal Evaluation, SEE- Semester End-exam Evaluation

⁺ Every I.A. test shall be conducted as per SEE scheme of valuation. However, scored marks shall be scaled down to 10. Average of two tests, by rounding off any fractional part thereof to next higher integer, shall be considered for CIE/ IA.

^{*}Students should do activity as per the list of suggested activities/ similar activities with prior approval of the teacher. Activity process must be initiated well in advance so that it can be completed well before the end of the term.

[@] Record Writing: average of marks allotted for all experiments shall be considered; fractional part of the average shall be rounded-off to next higher integer.

Composition of CLs

Sl. No.	Cognitive Levels (CL)	Weightage (%)
1	Remembering	20
2	Understanding	30
3	Applying	50
Total		100

Continuous Internal Evaluation (CIE) pattern

(i) Project/Student Activity (5 marks)

The student activities in Unit-2 or similar activities of can be assigned

Execution Mode:

- Maximum of 2 students in each batch for project activity.
- Either one of the project activity or any similar activity is mandatory for every batch.

3. Project activities shall be carried out throughout the semester and present the project report and demonstration at the end of the semester.
4. Report shall be qualitative and not to exceed 8 pages; one report per batch shall be submitted.
5. Each of the activity can be carried out off-class; however, demonstration/presentation should be done during laboratory sessions.
6. Assessment shall be made based on quality of activity in accordance with the following **rubrics** table.

(ii) Model of rubrics for assessing student activity (for every student)

Dimension	Scale					Marks (Example)
	1 Unsatisfactory	2 Developing	3 Satisfactory	4 Good	5 Exemplary	
1. Research and gathering information	Does not collect information relate to topic	Collects very limited information, some relate to topic	Collects basic information, most refer to the topic	Collects more information, most refer to the topic	Collects a great deals of information, all refer to the topic	3
2. Full-fills team roles and duties	Does not perform any duties assigned to the team role	Performs very little duties	Performs nearly all duties	Performs almost all duties	Performs all duties of assigned team roles	2
3. Shares work equality	Always relies on others to do the work	Rarely does the assigned work, often needs reminding	Usually does the assigned work, rarely needs reminding	Always does the assigned work, rarely needs reminding.	Always does the assigned work, without needing reminding	5
4. Listen to other team mates	Is always talking, never allows anyone to else to speak	Usually does most of the talking, rarely allows others to speak	Listens, but sometimes talk too much,	Listens and talks a little more than needed.	Listens and talks a fare amount	3
Total marks						ceil(13/4)= 4

(iii) CIE/IA Tests (10 Marks)

Two tests shall be conducted in accordance with SEE pattern and the marks shall be scaled down to 10. Average of two tests, rounding-off any fractional part thereof to next higher integer, shall be considered for CIE/IA.

(iv) Record Evaluation (10 Marks)

Every experiment shall be given marks, in the scale of 10, after its conduction based on student's performance and quality of write-up. Average of them, by rounding-off any fractional part thereof to next higher integer, shall be considered for CIE/IA.

Semester End-exam Evaluation (SEE) Scheme

Sl. No.	Scheme	Max. Marks
1	Write-up for two experiments (one each from Part-A and Part-B) with applicable circuit/block diagram/procedure/table/Ideal graph/formulae	15
2	Construction/Conduction of both the experiments.	20
3	Result	10
4	Viva-voce	05
TOTAL		50
Note: 1. Both parts have equal weightage in the examination; 6-hour experiments shall be trimmed/scaled down appropriately so that the student shall be able to perform in 3-hour exam. 2. Candidate is expected to submit record for the examination. 3. Student shall be allowed to execute the program even if she/he is unable to write the procedure/steps/algorithm.		

Laboratory Resource Requirements

Hardware Requirements: For a batch of 20 students.

Sl. No.	Equipments	Quantity
1	Kit to demonstrate Sampling theorem and aliasing effect	05
2	Kit to demonstrate PCM.	05
3	Delta Modulation and Detection Trainer kit	05
4	Adaptive Delta Modulation and Detection Trainer kit	05
5	Optical fiber communications trainer kit to cover all the experiments.	05
6	Dual Channel CRO (25 MHz)	10
7	Function generator (0-1 MHz)	10
8	Linear IC trainer	05
9	Power supply (+/- 5 Volts)	05
10	Computers (Core2duo/Dual core,1GB RAM,150HDD)	20
11	Crimping tool and Cable tester	10(each)
12	16 port switch	02
13	Web camera	06
14	Tool kit	01set
15	Digital multimeters	10
16	Network Interface Card	10

Model Questions for Practice and Semester End Examination

Note: The questions are indicative but not exhaustive.

Part A: Digital communication experiments

1. Conduct an experiment to prove the Sampling Theorem for low pass signals.
2. Conduct an experiment to study the effect of aliasing.
3. Perform an experiment to study Pulse Code Modulation and Demodulation.
4. Conduct an experiment to generate Delta modulated signal.
5. Conduct an experiment to study Adaptive delta modulation.
6. Perform an experiment to generate and detect BASK signal.
7. Perform an experiment to generate and detect BFSK signal.
8. Perform an experiment to generate and detect BPSK signal.
9. Perform an experiment to verify TDM with Fiber Communication System.
10. PC to PC communication using Fiber-optic Digital Link.

Part B: Data Communication and Networking experiments

11. Exercise on crimping Network Cable & Testing using Cable Tester.
12. Configuration of TCP/IP Protocols settings in Windows or Linux.
13. Install a peer to peer network and test with Net meeting.
14. Install a network between 3 or more computers using network switch and test for sharing resources.
15. Establish LAN between Linux & Windows Systems & Share Printer.
16. Install a Wireless network using Access Point and Wireless Network card between 3 or more computers and Test by Sharing a Printer.
17. Setup Internet using modem, PSTN Line/WLL/Broad Band and Internet account share internet through LAN.
18. Establish Video conference between 3 users using web camera & headphones
19. To Connect Computers in Star Topology using Wired Media and any Network Control Device.
20. To Install Network Interface Card to locate MAC address of Computer.

End

4ನೇ ಸೆಮಿಸ್ಟರ್-ಕನ್ನಡ ಕಲಿ-2 (ಕನ್ನಡೇತರರಿಗೆ ಕನ್ನಡ ಪರಿಚಯ)

4th Semester	Course: Kannada Kali-2	Course Code:15KA4NT (2016-17)
	No. of Credits:02	No. of teaching hours/week:02 No. of teaching hours/Semester:26
	Mode of Assessment and Evaluation: Semester End Examination (SEE) only. No CIE.	Maximum Marks: 50 (SEE only) Minimum Passing marks:20

ಉದ್ದೇಶ:

1. ಕೇಳುವುದು, ಗ್ರಹಿಸುವುದು, ನಿರರ್ಗಳವಾಗಿ ಮತ್ತು ಸ್ಪಷ್ಟವಾಗಿ ಓದುವ ಮತ್ತು ಮಾತನಾಡುವ (ಅಭಿವ್ಯಕ್ತಿಸುವ) ಸಾಮರ್ಥ್ಯವನ್ನು ಬೆಳೆಸುವುದು.
2. ಜ್ಞಾನಾರ್ಜನೆ, ಸಾಹಿತ್ಯಾಭಿರುಚಿ, ಚಿಂತನೆ ಮತ್ತು ಆನಂದಕ್ಕಾಗಿ ಸ್ವತಂತ್ರವಾಗಿ ಓದಲು, ಬರೆಯಲು ಮತ್ತು ಮಾತನಾಡಲು ಸಮರ್ಥರಾಗುವಂತೆ ಮಾಡುವುದು.
3. ಪದ ಸಂಪತ್ತನ್ನು ಹೆಚ್ಚಿಸಿಕೊಂಡು ಸ್ಪಷ್ಟ ಉಚ್ಚಾರಣೆಯೊಡನೆ ಲಿಖಿತ ಮತ್ತು ಮೌಖಿಕ ಚಟುವಟಿಕೆಗಳನ್ನು ಮಾಡಿಸಿ, ಸ್ವತಂತ್ರವಾಗಿ ಭಾಷೆಯ ಬಳಕೆ ಮಾಡುವುದು.
4. ನಾಡು-ನುಡಿ, ಸಂಸ್ಕೃತಿ ಮತ್ತು ಸಾಹಿತ್ಯಗಳ ಪರಿಚಯ ಮತ್ತು ಆತ್ಮೀಯ ಭಾವಾಭಿಮಾನವನ್ನು ಬೆಳೆಸುವುದು.
5. ಕ್ರಿಯಾತ್ಮಕ ಚಟುವಟಿಕೆಗಳಿಂದ ಭಾಷಾ ಕೌಶಲ್ಯದ ಸರಳ ಪ್ರಯೋಗ ಮಾಡಿಸುವುದು./ಕಲಿಸುವುದು.
(ಕ್ರಿಯಾತ್ಮಕ ಚಟುವಟಿಕೆ ಎಂದರೆ, ವರ್ಣಮಾಲೆ ಪರಿಚಯ, ವ್ಯಾಕರಣದ ಸರಳ ಪರಿಚಯ, ಗುಣಿತಾಕ್ಷರ, ಸಂಯುಕ್ತಾಕ್ಷರಗಳು, ನಾಮಪದ, ಲಿಂಗ, ವಚನ, ಪ್ರತ್ಯಯಗಳು, ವಾಕ್ಯರಚನೆ (ಕತ್ಯ, ಕರ್ಮ, ಕ್ರಿಯಾಪದ) ಇತ್ಯಾದಿ).

Course outcome:

1. Developing listening and speaking skills.
2. Easy Interaction with peers.
3. Students can use the language at ease in daily life situations

ಪಠ್ಯಕ್ರಮ ಮತ್ತು ಸರಳ ಭಾಷಾ ಕೌಶಲ್ಯ

(ಕನ್ನಡ ಕಲಿ-ಪಠ್ಯಪುಸ್ತಕ -ಶ್ರೀ ಲಿಂಗದೇವರು ಹಳೇಮನೆ - ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಹಂಪಿ ಪ್ರಕಾಶನ)

ಭಾಗ-2

ಪಾಠಗಳ ಕ್ರಮಾಂಕ Lesson No	ಪಠ್ಯವಸ್ತುವಿನ ವಿವರ - Curriculum Content	ಸೆಮಿಸ್ಟರ್ ಬೋಧನ ಆವಧಿ Total no.of Classes /Sem
Part-I		
11	Plan to go for a movie. Comparative, non-past tense, instrumental and ablative case	02
12	Conversation between Doctor & Patient. Potential forms, accusative case.	02
13	Enquiring about friend's family	02

	Past tense -d, and -t- and -id-, negation.	
14	Conversation between friends - Past tense -k - T - D and -id-v negation verbal noun	02
15	Routine activities of a Student.	01
16	About children's education. Continuous, Perfect tenses and negations.	02
17	Halebidu - Belur Relative participle, negation and Participle nouns.	02
18	Discussing about Examination and future plan-conditional and negative conditions.	03
19	Karnataka (Lesson for reading) (reading skill)	03
20	bEku bEDagaLu (Lesson for reading (Reading skill)	03
Part-II	Kannada Scripts	03
	ECA-word/sentence formation/letter/small essay writing	01
ಒಟ್ಟು ಗಂಟೆಗಳು		26

ಸೂಚನೆಗಳು:

- ಮೇಲಿನ ಪಾಠಗಳ ಪುನರಾವರ್ತಿತ ಭಾಗಗಳಿಗೆ ಬದಲಾಗಿ “ಕ್ರಿಯಾತ್ಮಕ ಚಟುವಟಿಕೆ”ಯಿಂದ ಗಳಿಸುವ ಅಕ್ಷರ ಜ್ಞಾನ ದಿಂದ ಪದ ಸಂಪತ್ತು ಹೆಚ್ಚಿಸಿ, ಪದಗಳಿಂದ ಸ್ವಂತ ವಾಕ್ಯಗಳ ರಚನೆ ಮಾಡಿಸುವುದು. (ಅಮ್ಮ, ಮೊಬೈಲ್, ಕನ್ನಡ ಭಾಷೆ, ಕವಿಗಳು, ನಾಟಕ, ಜನಪದ ಕಲೆ, ನಾಡಿನ ಪ್ರಸಿದ್ಧ ವ್ಯಕ್ತಿಗಳು, ಸಹೋದರ, ಸ್ನೇಹಿತ, ತರಕಾರಿ, ದೋಸೆ, ತಿಂಡಿ, ನಿಂದೆ, ಬಿಸಿ, ಚಳಿ, ಆಕಾಶ, ಓದು, ಇತ್ಯಾದಿ ನಿತ್ಯ ಬಳಕೆಯ ಸರಳ ಪದಗಳಿಂದ ವಾಕ್ಯರಚನೆ ಮತ್ತು 25-50 ಪದಗಳ ಕಿರು ಪ್ರಬಂಧ ರೂಪದ ಲೇಖನ ರಚನೆ).
- ಸಂಸ್ಥೆಯ ಪ್ರಾಚಾರ್ಯರಿಗೆ ವಿದ್ಯಾರ್ಥಿಯ ಮನವಿ ಪತ್ರ, ಕುಂದುಕೊರತೆಗಳ ಬಗ್ಗೆ ಸಂಬಂಧಿಸಿದವರಿಗೆ ಪತ್ರ, ಸ್ನೇಹಿತರಿಗೆ ಪತ್ರಗಳು, ಸರಳವಾಗಿ ಯಾವುದೇ ಸಾಮಾನ್ಯ ವಿಷಯಗಳ ಬಗ್ಗೆ ಪತ್ರಲೇಖನ. (6-10 ವಾಕ್ಯಗಳು).

ಆಕರ ಗ್ರಂಥಗಳು:

1. ಕನ್ನಡ ಕಲಿ-ಶ್ರೀ ಲಿಂಗದೇವರು ಹಳೇಮನೆ - ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಹಂಪಿ.
2. ಪ್ರಾಥಮಿಕ ಶಾಲೆಯ ಕನ್ನಡ ಪಠ್ಯಪುಸ್ತಕಗಳು
3. ಸರಳ ಕನ್ನಡ ವ್ಯಾಕರಣ ಪುಸ್ತಕಗಳು- ಎಂ.ವಿ ನಾಗರಾಜರಾವ್/ಇತರೆ ಲೇಖಕರು.
4. ಪ್ರಯೋಗ ಪ್ರಣತಿ-ಪ್ರಥಮ ಪಿಯುಸಿ ಪೂರಕ ಪಠ್ಯ.
5. ಸರಳ ಪತ್ರವ್ಯವಹಾರದ ಪುಸ್ತಕಗಳು

ಡಿಪ್ಲೋಮಾ 4ನೇ ಸೆಮಿಸ್ಟರ್-ಕನ್ನಡ ಕಲಿ-2 (ಕನ್ನಡೇತರರಿಗೆ ಕನ್ನಡ ಪರಿಚಯ)

ಸೆಮಿಸ್ಟರ್ ಅಂತಿಮ ಲಿಖಿತ ಪರೀಕ್ಷೆ

ಸಮಯ: 2 ಗಂಟೆಗಳು

ಗರಿಷ್ಠ ಅಂಕಗಳು:50

1. Fill in the blanks using the appropriate words.
2. Rewrite as directed.
3. Combine the following sentences.
4. Translate into Kannada.
5. Answer the following questions.
6. Fill in the blanks using the correct past tense forms of the verbs giving in the bracket.

7. Transform into negative.
8. Substitute and complete the sentence
9. Vocabulary (meanings of words) using formation of sentences (any five).
10. Questions from lessons 17 to 19. (Out of 6 questions, answer any 3 questions).
11. Scripts- consonants form- +vowel (10 types)
12. Conversation & other questions. (KK-Exercises)

ಮಾದರಿ ಪ್ರಶ್ನೆಪತ್ರಿಕೆ:

ಡಿಪ್ಲೋಮಾ 4ನೇ ಸೆಮಿಸ್ಟರ್-ಕನ್ನಡ ಕಲಿ-2 (ಕನ್ನಡೇತರರಿಗೆ ಕನ್ನಡ ಪರಿಚಯ)

ಸೆಮಿಸ್ಟರ್ ಅಂತಿಮ ಲಿಖಿತ ಪರೀಕ್ಷೆ

ಸಮಯ: 2 ಗಂಟೆಗಳು

ಗರಿಷ್ಠ ಅಂಕಗಳು:50

- I. (a) Fill in the blank using the correct past tense forms of the verbs given in the bracket. 3+2 =05

1. ಅವರು ನಿನ್ನೆ ಊರಿನಿಂದ (ಬಾ)
2. ಅವಳು ಒಂದು ಹೆಣ್ಣು ಮಗು (ಹೆರು)
3. ನಾನು ನಿನಗಾಗಿ ತುಂಬಾ ಹೊತ್ತು..... (ಕಾಯು)

(b) Fill in the blank using the correct verbal participle forms of the verbs given in the bracket.

1. ಆ ಹುಡುಗಿ ಮನೆ ಹೋದಳು. (ಬಿಡು)
2. ಅವನು ಇವತ್ತೆ ಊರಿನಿಂದ.....ನಾಳೆ ಬರುತ್ತಾನೆ. (ಹೊರಡು)

- II. Give the negative forms of the following sentence. (Any Five) 1X5=05

- ಅ) ನೀವು ಪುಸ್ತಕ ಕೊಡಿ.
- ಆ) ನೀವು ಸಿಗರೇಟ್ ಸೇದಬಹುದು.
- ಇ) ಅವರು ನನಗೆ ಚೆನ್ನಾಗಿ ಗೊತ್ತು.
- ಈ) ಅವರು ಕನ್ನಡ ಚೆನ್ನಾಗಿ ಕಲಿತರು.
- ಉ) ಅವಳು ತಲೆ ಬಾಚಿಕೊಂಡು ಬಂದಳು.
- ಊ) ಅವನಿಗೆ ಫೋನ್ ಬಂದಿದೆ.
- ಋ) ರವಿ ಮನೆಯಲ್ಲಿ ಮಲಗಿರ್ತಾನೆ.

- III. Translate into KANNADA. (Any Five)

2X5=10

- 1) Who will come with you?
- 2) Today Ms. Kamala will go to her native place.
- 3) You must drink butter milk daily.
- 4) Please, don't talk to me.

- 5) How much advance money did you pay for the hostel?
- 6) How many of you are learning Kannada seriously?
- 7) If I get good marks in diploma, I will get admission for BE program.
- 8) At what time today you will be available in the hostel?.

IV. Vocabulary.

(a) Write English equivalents of the Kannada words. (Any five) 1X5=05

1. ಆಗಸ 2. ಶೈಲಿ 3. ಅನುಮಾನ 4.ಪರೀಕ್ಷೆ 5.ಜಾತಿ 6.ನೈಸರ್ಗಿಕ 7.ಮತ 8. ವಾಣಿಜ್ಯ

(b) Write Kannada equivalents of the English words. (Any five) 1X5=05

1. Wealth 2. Religion 3. Memory 4.fear 5.Environment 6. Primary 7. Mistakes 8. Tall

VI. Conversation:

ಈ ಕೆಳಗಿನ ಅಪೂರ್ಣ ಸಂಭಾಷಣೆಯನ್ನು ಆವರಣದಲ್ಲಿ (bracket) ನೀಡಿರುವ ಪದಗಳನ್ನು ಅರ್ಥಮಾಡಿಕೊಂಡು ಪೂರ್ತಿ ಮಾಡಿ. -05

ರಾಜು: ನಿನಗೆ ನಿನ್ನೆ ಮೋಹನ್ ಸಿಕ್ಕನಾ?

ರಾಮು: negative) ನಿನಗೆ ಸಿಕ್ಕನಾ?

ರಾಜು (Positive) ಹೌದು, ನಿಮ್ಮನ್ನು ನೋಡುವುದಕ್ಕೆ ಹೋಗುತ್ತೀನಿ ಅಂತ ಹೇಳಿದ.

ರಾಮು: (Enquiring about meeting him)

ರಾಜು: ಅವನು ಕೆಲಸ ಬಿಟ್ಟನಂತೆ.

ರಾಮು: (Questioning)

ರಾಜು:(Answer).

VII.Transform the following sentences as per direction. (Any Five) 1X5=05

1. ಮಕ್ಕಳು ರಸ್ತೆಯಲ್ಲಿ ಆಟ ಆಡುತ್ತಾ (into present continuous) ಇದ್ದವು.
2. ಹುಡುಗರು ತರಗತಿಯಲ್ಲಿ ಸುಮ್ಮನೆ (into present continuous) ನಗುತ್ತಾ ಇದ್ದರು.
3. ಆ ಹೆಂಗಸರು ಜಗಳ ಆಡುತ್ತಾ ಇದ್ದಾರೆ. (into past continuous)
4. ತರಕಾರಿ ಕಡಿಮೆ ಬೆಲೆಗೆ ಸಿಗುತ್ತಾ ಇದೆ. (into past continuous)
5. ಅವನು ದಿನಾ ಇಲ್ಲಿಗೆ ಬರ್ತಾನೆ. (into habitual)
6. ಇಲ್ಲಿ ಬಸ್ಸುಗಳು ತುಂಬಾ ಓಡುತ್ತಾ ಇವೆ. (into habitual)
7. ಆಂಧ್ರಪ್ರದೇಶದಿಂದ ಬಂದಿದ್ದ ವಿದ್ಯಾರ್ಥಿಗಳು ಎಲ್ಲಿದ್ದಾರೆ?(into present perfect)

VIII.Write the Kannada alphabet in the traditional order. 05

OR

ಹಳೇಬೀಡು ಬೇಲೂರಿನಿಂದ ಎಷ್ಟು ದೂರದಲ್ಲಿದೆ ಮತ್ತು ಯಾವ ಜಿಲ್ಲೆಯಲ್ಲಿದೆ? ಇಲ್ಲಿನ ದೇವಸ್ಥಾನಗಳ ಹೆಸರುಗಳು ಏನು ಮತ್ತು ಅವುಗಳನ್ನು ಕಟ್ಟಿಸಿದವರು ಯಾರು?

IX. Combine the following: (Any One) 1X1=01

(A) 1) ಮನೆ + ಇಂದ =

2) ಮ್ + ಔ =

(B) Combine the following sentence using verbal participle form. (Any One) 1X1=01

- ಅ) ಹುಡುಗರು ದುಡ್ಡು ಕೊಟ್ಟರು.
ಹುಡುಗರು ಸರ್ಕಸ್ ನೋಡಿದರು.
ಆ) ನಾನು ಕೆಲಸ ಮಾಡ್ತಾ ಇದ್ದೆ.
ನಾನು ಎಂ.ಎ. ಓದಿದೆ.

(B) Frame meaningful small sentences with using words given below:(Any Three) -1X3=03.

ಅ) ಮರ ಆ) ಫಲ ಇ) ಊರು ಈ) ಪೇಪರ್ ಉ) ಇವರು ಊ) ಮನೆ ಎ) ಶಾಲೆ

ಕನ್ನಡ ಪಠ್ಯಕ್ರಮ ರಚನಾ ಸಮಿತಿ

• ಸಂಪಾದಕೀಯ ಸಮಿತಿ:

1. ಶ್ರೀ ಟಿ ಎಲ್ ರವೀಂದ್ರ, ಉಪನ್ಯಾಸಕರು, ಸರ್ಕಾರಿ ಜಿ.ಆರ್.ಐ.ಸಿ.ಪಿ ಬೆಂಗಳೂರು.
2. ಶ್ರೀ ಟಿ. ತಿಮ್ಮಪ್ಪ, ಉಪನ್ಯಾಸಕರು(ಆಯ್ಕೆ ಶ್ರೇಣಿ), ಯಾಂತ್ರಿಕ ವಿಭಾಗ, ಸರ್ಕಾರಿ ಪಾಲಿಟೆಕ್ನಿಕ್, ತುಮಕೂರು.

• ಸಲಹಾ ಸಮಿತಿಯ ಬಾಹ್ಯ ಸಂಪನ್ಮೂಲ ವ್ಯಕ್ತಿಗಳು.

1. ಪ್ರೊ. (ಡಾ.) ಡಿ. ಪಾಂಡುರಂಗ ಬಾಬು, ಕುಲಸಚಿವರು, ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಹಂಪಿ.
2. ಪ್ರೊ. (ಡಾ.) ಅಶೋಕ್ ಕುಮಾರ್ ರಂಜರೆ, ಪ್ರಾಧ್ಯಾಪಕರು, ಪ್ರಸಾರಾಂಗ ವಿಭಾಗ, ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಹಂಪಿ.
3. ಪ್ರೊ. (ಡಾ.) ಕೆ ವೈ ನಾರಾಯಣ ಸ್ವಾಮಿ, ಸಹ ಪ್ರಾಧ್ಯಾಪಕರು, ಸ್ನಾತಕೋತ್ತರ ವಿಭಾಗ, ಸರ್ಕಾರಿ ಕಲಾ ಕಾಲೇಜು, ಬೆಂಗಳೂರು.
4. ಪ್ರೊ. (ಡಾ.) ಜೆ ಬಾಲಕೃಷ್ಣ, ಪ್ರಾಧ್ಯಾಪಕರು ಹಾಗೂ ಮುಖ್ಯಸ್ಥರು, ಕನ್ನಡ ಭಾಷಾ ಅಧ್ಯಯನ ವಿಭಾಗ, ಕೃಷಿ ವಿಶ್ವವಿದ್ಯಾಲಯ, (ಜಿಕೆವಿಕೆ) ಹೆಬ್ಬಾಳ, ಬೆಂಗಳೂರು.

KARNATAKA STATE BOARD OF TECHNICAL EXAMINATION, BENGALURU.															
TEACHING AND EXAMINATION SCHEME FOR KANNADA COURSE IN DIPLOMA PROGRAMME															
SEMESTER: III											COMMON TO ALL DIPLOMA PROGRAMMES			C-15 Curriculum	
SL.NO	COURSE NAME	Teaching Department	COURSE /QP CODE	Teaching scheme					Examination scheme						
				Contact hours					Exam paper duration in Hrs	End exam		Maximum CIE Marks (IA+SA)	Minimum Marks for passing. (IA + SA)		
				TH	TU	PR	TOTAL	Credit		Max marks	Min marks				
THEORY															
1	KANNADA KALI-1	KA	15KA3NT	2	-	-	2	2	-	-	-	50	20		
2	TANTRIKA KANNADA -1	KA	15KA3KT	2	-	-	2	2	-	-	-	50	20		

CIE- Continuous Internal Examination: SEE-Semester End Examination: IA-Internal Assessment Tests: SA- Student Activity.

- Note: 1. Candidates studied Kannada as one subject in 10th standard shall take Tantrika Kannada 1 & 2. Others may take "Kannada Kali-1&2".
2. In 3rd Semester- Assessment is only by CIE and no SEE. Average marks of three IA tests shall be rounded off to the next higher digit. Rubrics to be devised appropriately to assess student activity.

KARNATAKA STATE BOARD OF TECHNICAL EXAMINATION, BENGALURU.															
TEACHING AND EXAMINATION SCHEME FOR KANNADA COURSE IN DIPLOMA PROGRAMME															
SEMESTER: IV											COMMON TO ALL DIPLOMA PROGRAMMES			C-15 Curriculum	
SL.NO	COURSE NAME	Teaching Department	COURSE /QP CODE	Teaching scheme					Examination scheme						
				Contact hours					Exam paper duration in Hrs	Sem End Exam		Maximum CIE Marks (IA+SA)	Minimum Marks for passing. (IA + SA)		
				TH	TU	PR	TOTAL	Credit		Max Exam Marks	Min Passing Marks				
THEORY															
1	KANNADA KALI-2	KA	15KA4NT	2	-	-	2	2	2	50	20	-	-		
2	TANTRIKA KANNADA -2	KA	15KA4KT	2	-	-	2	2	2	50	20	-	-		

CIE- Continuous Internal Examination: SEE-Semester End Examination: IA-Internal Assessment Tests: SA- Student Activity.

- Note: In 4th Semester- Assessment is only by SEE and no CIE. To award diploma certificate, passing in Kannada course is mandatory. However Kannada course is not included in the eligibility criteria for promotion to the higher semester.

ಡಿಪ್ಲೋಮಾ-ತಾಂತ್ರಿಕ ಕನ್ನಡ-2 (ಕನ್ನಡ ಬಲ್ಲವರಿಗಾಗಿ)

4ನೇ ಸೆಮಿಸ್ಟರ್ - ತಾಂತ್ರಿಕ ಕನ್ನಡ -2 (ಸಾಹಿತ್ಯ ಮತ್ತು ಭಾಷಾ ಕೌಶಲ್ಯ ಪ್ರಯೋಗ)
ಪಠ್ಯಕ್ರಮ

4 th Semester	Course: ತಾಂತ್ರಿಕ ಕನ್ನಡ -2	Course Code: 15KA4KT (2016-17)
	No. of Credits: 02	No. of teaching hours/week: 02 No. of teaching hours/Semester:26
	Mode of Assessment and Evaluation: Semester End Examination (SEE)only. No CIE.	Maximum Marks: 50 (SEE only) Minimum Passing marks: 20

ಪಠ್ಯ ಪ್ರಕಾರ	ಪಾಠ	ಪಠ್ಯದ ಹೆಸರು/ಲೇಖಕರು/ಪ್ರಕಟಣೆ	ಸೆಮಿಸ್ಟರ್ ಬೋಧನಾವಧಿ ಗಂಟೆಗಳು
ಕಾವ್ಯ ಮಂಜರಿ-(ಬದುಕು ಮತ್ತು ಮಾನವತೆ)	1	(ಕಾವ್ಯ ಗುಚ್ಚಗಳು) (1) ನನ್ನ ಹಣತೆ-ಡಾ:ಜಿ.ಎಸ್.ಎಸ್. (2) ಮಂಕು ತಿಮ್ಮನ ಕಗ್ಗ-ಡಿ.ವಿ.ಜಿ	02
ಸಂಸ್ಕೃತಿ	2	ಅಲೆಕ್ಸಾಂಡರ್‌ನ ಗುರುದಕ್ಷಿಣೆ-ಮಾಸ್ತಿ ವೆಂಕಟೇಶ ಅಯ್ಯಂಗಾರ್	02
ಪರಿಸರ/ಸಾಹಸ	3	ವೈನಾಡಿನ ನರಭಕ್ಷಕರು - ಪೂರ್ಣಚಂದ್ರ ತೇಜಸ್ವಿ	02
ಕ್ರೀಡೆ/ಕಲೆ	4	ಜಿ.ಆರ್.ವಿಶ್ವನಾಥ್-ಡಾ: ಕ.ಪುಟ್ಟಸ್ವಾಮಿ	02
ತಂತ್ರಜ್ಞಾನ	5	ಮಾಹಿತಿ ತಂತ್ರಜ್ಞಾನ-ಒಂದು ಸ್ಥೂಲ ನೋಟ-ಜಿ.ಎನ್.ನರಸಿಂ:ಮೂರ್ತಿ	02
ಯಶೋಗಾಥೆ/ವ್ಯಕ್ತಿಚಿತ್ರಣ	6	ಡಾ:ವಿಶ್ವೇಶ್ವರಯ್ಯ-ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹ್ಯ - ಎ.ಎನ್.ಮೂರ್ತಿರಾವ್	02
ಭಾಷಾ ಕೌಶಲ್ಯ- ಚಟುವಟಿಕೆಗಳು	7	ಲಿಖಿತ ಅಭಿವ್ಯಕ್ತಿ: ಪತ್ರಗಳ ರಚನೆ-ವ್ಯಾಖ್ಯೆ: ಪತ್ರದ ಭಾಷೆ, ಶೈಲಿ, ನಮೂನೆಗಳು (1) ವೈಯಕ್ತಿಕ ಪತ್ರ (ಪ್ರವಾಸ/ಕೋರಿಕೆ.(ಮನವಿ/ಆತ್ಮಿಯರಿಗೆ ಬರೆಯುವ ಪತ್ರಗಳು)..) (2) ಪತ್ರ ವ್ಯವಹಾರ (ವಾಣಿಜ್ಯ ಸಂಸ್ಥೆಗಳಿಗೆ ಬರೆಯುವ/ಪ್ರತ್ಯುತ್ತರ ಪಡೆಯುವ, ಬ್ಯಾಂಕ್‌ಗಳಿಗೆ/ಸರ್ಕಾರಿ ಕಚೇರಿಗಳಿಗೆ ಬರೆಯುವ ಪತ್ರಗಳು....)-ಮಾದರಿಗಳು (3) ಅಭ್ಯರ್ಥನ ಪತ್ರ (ಹುದ್ದೆಗೆ ಅರ್ಜಿ) -1-2 ನಮೂನೆಗಳು-4-5 ಪ್ರಶ್ನೆಗಳು (4) ಓದುಗರ ವಿಭಾಗಕ್ಕೆ ಪತ್ರಿಕಾ ಸಂಪಾದಕರಿಗೆ ಬರೆಯುವ ಪತ್ರಗಳು 1 ನಮೂನೆ-3-4 ವಿಷಯಗಳ ಮೇಲೆ ಪತ್ರ ಬರೆಯುವುದು.	06
	8	ಸಂಕ್ಷಿಪ್ತ ಲೇಖನ (ಸಾರಾಂಶ ಲೇಖನ)	02
	9	ಮೌಖಿಕ ಅಭಿವ್ಯಕ್ತಿ> ಚರ್ಚಾ ಸ್ಪರ್ಧೆ/ಕೂಟ-ಭಾಷಣ-ಆಶುಭಾಷಣ -ಕಾರ್ಯಕ್ರಮ ನಿರೂಪಣೆ ಮಾಡುವುದು.	06
		ಒಟ್ಟು ಅವಧಿ	26 ಗಂಟೆಗಳು

ಡಿಪ್ಲೋಮಾ 4ನೇ ಸೆಮಿಸ್ಟರ್ (ಕನ್ನಡಬಲ್ಲ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ)
ತಾಂತ್ರಿಕ ಕನ್ನಡ-2

ಪರಿವಿಡಿ

ಭಾಗ-1

ಕಾವ್ಯ ಗುಚ್ಛ

1. ನನ್ನ ಹಣತೆ-ಡಾ:ಜಿ.ಎಸ್.ಶಿವರುದ್ರಪ್ಪ
2. ಮಂಕುತಿಮ್ಮನ ಕಗ್ಗ-ಡಿವಿಜಿ

ಗದ್ಯ ಸಾಹಿತ್ಯ

3. ಅಲೆಕ್ಸಾಂಡರನ ಗುರುದಕ್ಷಿಣೆ (ಸಂಸ್ಕೃತಿ-ಕತೆ)-ಶ್ರೀನಿವಾಸ (ಮಾಸ್ತಿ)
4. ವೈನಾಡಿನ ನರಭಕ್ಷಕರು (ಪರಿಸರ-ಸಾಹಸ)-ಕೆ.ಪಿ.ಪೂ.ತೇಜಸ್ವಿ
5. ಲಿಟ್ಟಲ್ ಮಾಸ್ಟರ್ (ಕ್ರೀಡೆ/ಕಲೆ)-ಡಾ.ಕೆ.ಪುಟ್ಟಸ್ವಾಮಿ
6. ಮಾಹಿತಿ ತಂತ್ರಜ್ಞಾನ-ಜಿ.ಎನ್.ನರಸಿಂಹಮೂರ್ತಿ
7. ಡಾ:ವಿಶ್ವೇಶ್ವರಯ್ಯ-ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹ್ಯ-ಎ.ಎನ್.ಮೂರ್ತಿರಾವ್

ಭಾಗ-2 -ಭಾಷಾ ಕೌಶಲ್ಯ ಚಟುವಟಿಕೆಗಳು

(1)ಬರಹ ರೂಪದ ಸಂವಹನ ಕನ್ನಡ-ಅಭಿವ್ಯಕ್ತಿಯ ಸ್ವರೂಪ
ಔಪಚಾರಿಕ ಮತ್ತು ಅನೌಪಚಾರಿಕ ಪತ್ರಗಳು

- (ಅ) ಪತ್ರವ್ಯವಹಾರ-ವ್ಯಾಖ್ಯೆ-ವಿವರಣೆ
- (ಆ) ಪತ್ರಗಳ ಮಾದರಿಗಳು

1. ವಾಣಿಜ್ಯ ಪತ್ರಗಳು-ವ್ಯಾಖ್ಯೆ, ಕೆಲವು ವಿಧಗಳು
2. ಖಾಸಗಿ/ವೈಯಕ್ತಿಕ ಪತ್ರಗಳು
3. ಪತ್ರಿಕೆಗಳಿಗೆ ಬರೆಯುವ (ಓದುಗರ)ಪತ್ರಗಳು
4. ಅಭ್ಯರ್ಥನ ಪತ್ರಗಳು

(2) ಸಾರಾಂಶ ಲೇಖನ: ವ್ಯಾಖ್ಯೆ, ಉದ್ದೇಶ, ವಿಧಾನಗಳು.

3 . ಮೌಖಿಕ ಅಭಿವ್ಯಕ್ತಿ ಚಟುವಟಿಕೆಗಳು(ತರಗತಿ ಚಟುವಟಿಕೆಗಳು)

1. ವಿಷಯಾತ್ಮಕ ಭಾಷಣಗಳು
2. ಆಶುಭಾಷಣ (ರಚನಾತ್ಮಕ ವಿಷಯಗಳು)
3. ಚರ್ಚೆ (ವಿಚಾರ ವಿನಿಮಯ/ಪರ-ವಿರುದ್ಧ ವಾದ ಮಂಡನೆ)
4. ನಿರೂಪಣೆ

Course outcome:

1. Developing listening and speaking skills.
2. Easy Interaction with peers.
3. Students can use the language at ease in daily life situations

ಡಿಪ್ಲೋಮಾ ನಾಲ್ಕನೇ ಸೆಮಿಸ್ಟರ್ (ಕನ್ನಡ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ)

ತಾಂತ್ರಿಕ ಕನ್ನಡ-2

ಸಮಯ: 2.00 ಗಂಟೆ

ಅಂಕಗಳು: 50

I. ಕೆಳಗಿನ ಯಾವುದೇ ಐದು ಪ್ರಶ್ನೆಗಳಿಗೆ 1-2 ಪೂರ್ಣ ವಾಕ್ಯಗಳಲ್ಲಿ ಉತ್ತರಿಸಿ. 1X5=05

- (1) ಮಾಹಿತಿ ತಂತ್ರಜ್ಞಾನದ ಮಾಹಿತಿಯನ್ನು ನಷ್ಟಗೊಳಿಸುವ ಅನಿಷ್ಟ ಯಾವುದು?
- (2) ದಿವಾನ್ ಪದವಿ ಬಂದಾಗ ಸರ್.ಎಂ.ವಿಶ್ವೇಶ್ವರಯ್ಯನವರು ತಮ್ಮ ತಾಯಿಗೆ ಹೇಳಿದ ಮಾತೇನು?
- (3) ಅರಿಸ್ಟಾಟಲ್ ಯಾರು ಮತ್ತು ಅವರು ಅಲೆಕ್ಸಾಂಡರನಿಗೆ ಏನಾಗಬೇಕು?
- (4) ಸುತ್ತೋಲೆ ಅಥವಾ ಪರಿಪತ್ರ ಎಂದರೇನು?
- (5) ಫಿನಿಕ್ಸ್ ಎಂದರೇನು?
- (6) 'ಖೆಡ್ಡಾ' ಎಂದರೇನು?
- (7) ನಿರೂಪಕರೆಂದರೆ ಯಾರು?

II. ಕೆಳಗಿನ ಯಾವುದೇ ಮೂರು ಪ್ರಶ್ನೆಗಳಿಗೆ ಸಂಕ್ಷಿಪ್ತವಾಗಿ ಉತ್ತರಿಸಿ. 5X3=15

- (1) ಕವಿ "ಹಣತೆ ಹಚ್ಚುತ್ತೇನೆ ನಾನು" ಎಂದು ಏಕೆ ಹೇಳುತ್ತಾರೆ?
- (2) ಕ್ಲಿಯಾಂತ್ಸನ ಸಾವು
- (3) ಕಾಕನಕೋಟೆ ಕಾಡು ಹೇಗಿದೆ?
- (4) ಅಂತರಜಾಲದ ಉಪಯೋಗಗಳು.
- (5) ಅನೌಪಚಾರಿಕ ಅಭಿವ್ಯಕ್ತಿ ಎಂದರೇನು ತಿಳಿಸಿ.
- (6) ಚರ್ಚೆ - ವ್ಯಾಖ್ಯೆ ಮತ್ತು ಉಪಯೋಗದ ಬಗ್ಗೆ ಬರೆಯಿರಿ.

III. ಈ ಕೆಳಗಿನ ಯಾವುದೇ ಮೂರು ಪ್ರಶ್ನೆಗಳಿಗೆ ವಿವರಣಾತ್ಮಕ ಉತ್ತರ ಬರೆಯಿರಿ. 10X3=30

(ಅ) ಹುಲ್ಲಾಗು ಬೆಟ್ಟದಡಿ..... ಕಗ್ಗದಲ್ಲಿ ಮನುಷ್ಯ ಏನಾಗಬೇಕೆಂದು ಮತ್ತು ಸಂಗೀತ ಕಲೆಯೊಂದು ಸಾಹಿತ್ಯ ಕಲೆಯೊಂದು...." ಕಗ್ಗದಲ್ಲಿ ಕವಿ ಇವೆಲ್ಲ ಮನುಷ್ಯನಿಗೆ ಏಕೆ ಬೇಕೆಂದು ಹೇಳುತ್ತಾರೆ?

(ಆ) ಅಣ್ಣನನ್ನು ಕಾಪಾಡಲು ಯೇಗ ಮಾಡಿದ ಸಾಹಸವನ್ನು ವಿವರಿಸಿ.

(ಅಥವಾ)

ಅತಿಯಾದ ನಗರೀಕರಣಕ್ಕಾಗಿ ಕಾಡುಗಳ ನಾಶದಿಂದ ಪರಿಸರದ ಮೇಲಾಗುವ ಪರಿಣಾಮಗಳ ಬಗ್ಗೆ ಬರೆಯಿರಿ.

(ಇ) ನೀವು ಕಾಲೇಜಿನಿಂದ ಹೋಗಿಬಂದ ಪ್ರವಾಸದ ಅನುಭವ ಕುರಿತು ನಿಮ್ಮ ಗೆಳೆಯರಿಗೆ ಪತ್ರ ಬರೆಯಿರಿ.

(ಈ) ಕೆಳಗಿನ ವಿಷಯವನ್ನು ಒಂದು ಸೂಕ್ತ ಶೀರ್ಷಿಕೆ ಸಹಿತ 30 ಪದಗಳ ಮಿತಿಯಲ್ಲಿ ಸಂಕ್ಷೇಪಗೊಳಿಸಿ.

ನೀಲಾಂಬರ ದ್ವೀಪ. ಇದೊಂದು ಸುಂದರ ದ್ವೀಪ. ಪ್ರವಾಸಿಗಳಿಗೆ ಸ್ವರ್ಗಸಮಾನ ದ್ವೀಪ. ಈ ದ್ವೀಪ ಹಿಂದೂ ಮಹಾಸಾಗರದ ದಕ್ಷಿಣಕ್ಕಿರುವ ಆರು ದ್ವೀಪ ಸಮೂಹದಲ್ಲಿ ಮಧ್ಯದಲ್ಲಿ ಹುಣ್ಣಿಮೆ ಚಂದ್ರನಂತೆ ಕಂಗೊಳಿಸುತ್ತಿರುವ ದೊಡ್ಡ ದ್ವೀಪ. ಈ ದ್ವೀಪ ಒಂದು ಭಾಗದಲ್ಲಿ ಹಸಿರು ಚಾದರ ಹಾಸಿದಂತೆ ಸಮತಟ್ಟಾದ ಹುಲ್ಲುಗಾವಲು. ಇನ್ನೊಂದು ಪಕ್ಕ ಬಗೆಬಗೆಯ ಹಣ್ಣುಗಳ ಮತ್ತು ಹೂವುಗಳ ಗಿಡಗಳು ಮತ್ತು ಅಡಿಕೆ, ಮಾವು, ಮೆಣಸು, ಏಲಕ್ಕಿ, ಲವಂಗದಂತಹ ಗಿಡ-ಮರಗಳಿಂದ ಕೂಡಿದೆ.ಈ ದ್ವೀಪದ ಮಧ್ಯೆ ಕಿರೀಟದಂತೆ ನಮ್ಮ ಉದಕಮಂಡಲದಂತಿರುವ ಹಸಿರಿನ ಬೆಟ್ಟ, ನಿಸರ್ಗದತ್ತ ಹೂವುಗಳ ಗಿಡಗಳಿಂದ ಪುಷ್ಪೋದ್ಯಾನದಂತಿದೆ. ಪ್ರಕೃತಿಯೇ ನಿರ್ಮಿಸಿರುವ ತಿಳಿನೀರಿನ ಸುಂದರ ಕೊಳ ಈ ಬೆಟ್ಟದ

ಆಕರ್ಷಣೆಯಾಗಿದೆ. ಹೀಗಾಗಿ ಈ ದ್ವಿಪ ಪ್ರವಾಸಿಗರಿಗೆ ಅಪಾರ ಆಕರ್ಷಕ ತಾಣವಾಗಿದೆ. ಇಲ್ಲಿನ ಜನ ಸಹ ಸೌಜನ್ಯಶೀಲರು. ಸೃಷ್ಟಿಯ ಶೃಂಗಾರವನ್ನೆಲ್ಲ ಒಳಗೊಂಡ ಈ ದ್ವಿಪದ ಮುಖ್ಯ ಕಸುಬು ಕೃಷಿ, ತೋಟಗಾರಿಕೆ ಮತ್ತು ಪ್ರವಾಸೋದ್ಯವಾಗಿರುವುದರಿಂದ, ಇದೊಂದು ಶ್ರೀಮಂತ ದ್ವಿಪವಾಗಿದೆ.

ಕನ್ನಡ ಪಠ್ಯಕ್ರಮ ರಚನಾ ಹಾಗೂ ಪಠ್ಯಪುಸ್ತಕ ಸಮಿತಿ

• ಸಂಪಾದಕೀಯ ಸಮಿತಿ:

1. ಶ್ರೀ ಟಿ ಎಲ್ ರವೀಂದ್ರ, ಉಪನ್ಯಾಸಕರು, ಸರ್ಕಾರಿ ಜಿ.ಆರ್.ಐ.ಸಿ.ಪಿ ಬೆಂಗಳೂರು.
2. ಶ್ರೀ ಟಿ. ತಿಮ್ಮಪ್ಪ, ಉಪನ್ಯಾಸಕರು(ಆಯ್ಕೆ ಶ್ರೇಣಿ), ಯಾಂತ್ರಿಕ ವಿಭಾಗ, ಸರ್ಕಾರಿ ಪಾಲಿಟೆಕ್ನಿಕ್, ತುಮಕೂರು.

• ಸಲಹಾ ಸಮಿತಿಯ ಬಾಹ್ಯ ಸಂಪನ್ಮೂಲ ವ್ಯಕ್ತಿಗಳು.

1. ಪ್ರೊ. (ಡಾ.) ಡಿ. ಪಾಂಡುರಂಗ ಬಾಬು, ಕುಲಸಚಿವರು, ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಹಂಪಿ.
2. ಪ್ರೊ. (ಡಾ.) ಅಶೋಕ್ ಕುಮಾರ್ ರಂಜರೆ, ಪ್ರಾಧ್ಯಾಪಕರು, ಪ್ರಸಾರಾಂಗ ವಿಭಾಗ, ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಹಂಪಿ.
3. ಪ್ರೊ. (ಡಾ.) ಕೆ ವೈ ನಾರಾಯಣ ಸ್ವಾಮಿ, ಸಹ ಪ್ರಾಧ್ಯಾಪಕರು, ಸ್ನಾತಕೋತ್ತರ ವಿಭಾಗ, ಸರ್ಕಾರಿ ಕಲಾ ಕಾಲೇಜು, ಬೆಂಗಳೂರು.
4. ಪ್ರೊ. (ಡಾ.) ಜೆ ಬಾಲಕೃಷ್ಣ, ಪ್ರಾಧ್ಯಾಪಕರು ಹಾಗೂ ಮುಖ್ಯಸ್ಥರು, ಕನ್ನಡ ಭಾಷಾ ಅಧ್ಯಯನ ವಿಭಾಗ, ಕೃಷಿ ವಿಶ್ವವಿದ್ಯಾಲಯ, (ಜಿಕೆವಿಕೆ) ಹೆಬ್ಬಾಳ, ಬೆಂಗಳೂರು.