1343 **Code : 20SC01T**

Register Number | 4 | 5 | 7 | E | C | 2 | 1 | 0 | 0 | 4 |

I & II Semester Diploma Examination, June/July-2023

ENGINEERING MATHEMATICS

Time : 3 Hours] **[Max. Marks : 100**

Instructions : (i) Answer **one** full question from each section.
(ii) One full question carries **20** marks.

SECTION – I

1. (a) Solve for x, $\begin{vmatrix} 1 & 2 & 3 \\ 2 & x & 3 \\ 3 & 4 & 3 \end{vmatrix} = 0$ **4**

OR

If $A = \begin{bmatrix} 1 & 5 \\ 2 & 3 \end{bmatrix}$, Find $A + A^T$.

(b) Using Cramer's rule, find the solution of the system of equations $2y - z = 0$, and $x + 3y = -4$, $3x + 4y = 4$ **6**

OR

Which of the matrix has no inverse ?

$A = \begin{bmatrix} 1 & 5 \\ 0 & -1 \end{bmatrix}$, $B = \begin{bmatrix} 2 & 6 \\ -1 & -3 \end{bmatrix}$ $C = \begin{bmatrix} 3 & 2 \\ 12 & 8 \end{bmatrix}$

(c) Find the characteristic equation and characteristic roots value for the matrix $\begin{bmatrix} 1 & 2 \\ 3 & 1 \end{bmatrix}$ **5**

OR

If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 0 \\ 4 & 3 \end{bmatrix}$, then verify that $(A + B)^T = A^T + B^T$

(d) Consider the matrix **5**

If $A = \begin{bmatrix} 2 & 1 \\ 3 & 5 \end{bmatrix}$, find A^{-1}.

OR

If $A = \begin{bmatrix} 2 & 1 \\ -3 & 5 \end{bmatrix}$ & $B = \begin{bmatrix} 9 & 2 \\ -3 & 5 \end{bmatrix}$, find AB.

SECTION – II

(Match the following)

P

2. (a)
(A) Equation of a straight line passing through a given point (x, y) and having slope m is
(B) Equation of a straight line passing through two points (x_1, y_1) and (x_2, y_2) is
(C) The equation of a straight line whose x and y-intercepts are a, b respectively is
(D) If two lines are perpendicular then product of their slopes is equal to

Q

(1) $\frac{x}{a}+\frac{y}{b}=1$
(2) $y-y_1=m(x-x_1)$
(3) -1
(4) $\frac{y-y_1}{x-x_1}=\frac{y_2-y_1}{x_2-x_1}$ **4**

Answers :

P	Q
A	
B	
C	
D	

OR

(Match the following)

P

(A) If two lines with slopes m_1 and m_2 are parallel then 'θ' is
(B) Equation of a straight line whose slope is m and y intercept is C.
(C) Slope of line $ax + by + c = 0$
(D) Slope of a line joining two points $(x_1\ y_1)$ and $(x_2\ y_2)$.

Q

(1) $y = mx + c$
(2) 0 (zero)
(3) $\frac{y_2-y_1}{x_2-x_1}$
(4) $-\frac{a}{b}$

Answers :

P	Q
A	
B	
C	
D	

(b) Find the equation to the perpendicular to the line $6x - 5y - 2 = 0$ and passing through $(2, -3)$. **1343**

OR

Are the lines $4x + 6y + 7 = 0$ and $2x + 3y - 1 = 0$ parallel to each other ? Justify **6**

(c) Find the equation of straight line parallel to $5x + 6y - 10 = 0$ and passing through the point $(-3, 3)$.

OR

Are the lines $3x + 4y + 7 = 0$ and $28x - 21y + 50 = 0$ are perpendicular to each other ? Justify. **5**

(d) Find the angle between the lines $x + 3y + 5 = 0$ and $4x + 2y - 7 = 0$

OR

Find the equation of straight line which passes through the points $(-2, 3)$ and $(-5, 6)$. **5**

SECTION – III

3. (a) Determine the value of $\cos(570°)$ and $\sin(330°)$.

OR

Convert 45 degree into radian and $\frac{11\pi}{5}$ radian into degree. **4**

(b) If $A + B = \frac{\pi}{4}$ prove that $(1 + \tan A)(1 + \tan B) = 2$ **6**

OR

Prove that $\sin 3A = 3\sin A - 4\sin^3 A$

(c) Given $\tan A = \frac{18}{17}$ and $\tan B = \frac{1}{35}$ show that $A - B = \frac{\pi}{4}$ **5**

OR

Show that : $\frac{\cos(360° - A)\cdot\tan(360° + A)}{\cot(270° - A)\cdot\sin(90° + A)} = 1$

(d) Prove that $\cos 55° + \cos 65° + \cos 175° = 0$ **5**

OR

Show that $\frac{\sin 40° + \sin 20°}{\cos 40° + \cos 20°} = \frac{1}{\sqrt{3}}$

SECTION – IV

4. (a) If $y = \sin x + \log x + e^x + \tan x$, then find $\frac{dy}{dx} = ?$ **4**

OR

If $\frac{dy}{dx} = 4x^3 + 3x^2$, then find $\frac{d^2y}{dx^2}$ at $(1, 2)$

(b) Using chain rule of differentiation, find the derivative of the function $y = (3x + 8)^5$ 6

OR

Using composite rule find the derivative of the function $y = \log(\sin(\log x))$

(c) The distance covered by a body in t seconds is given by $S = 4t - 5t^2 + 2t^3$, find the velocity and acceleration when $t = 2$ sec. 5

OR

Distance travelled by a car is given by $S = 160t - 16t^2$ metre and time in seconds. When does the car stop ?

(d) Find the maximum and minimum values of the function $x^3 - x^2 - x = 0$. 5

OR

Find the equation of the tangent to the curve $y = 2 - 3x + x^2$ at (1, 2)

SECTION – V

5. (a) Integrate : $\cos x + e^x + \frac{1}{x} + x^2$, w.r. to x. 4

OR

The area under the curve $y = x^2$ between $x = 1$, and $x = 2$ is equal to …

(b) Using the rule of integration by parts evaluate the integral $\int x \sin 2x.dx$ 6

OR

Evaluate $\int \sin 2x \cos 3x \, dx$

(c) Find $\int_0^{\pi/2} \sin^2 x.dx$ 5

OR

Evaluate $\int \sin^5 x \cos x \, dx$

(d) The area enclosed by the curve $y = x^2 + 1$, x-axis between $x = 1$, $x = 3$, calculate the area enclosed. 5

OR

Find the volume generated by rotating the curve $y = \sqrt{x+2}$ about x-axis between $x = 0$ and $x = 2$.