

Register
Number

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I Semester Diploma Examination, April/May-2021

ENGINEERING MATHEMATICS

[Max. Marks : 100

Time : 3 Hours]

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

SECTION - I

1. (a) Find the value of x ,
if $\begin{vmatrix} 1 & 2 & 9 \\ 2 & x & 0 \\ 3 & 7 & -6 \end{vmatrix} = 0$. 4
- (b) If $A = \begin{bmatrix} 2 & 1 \\ 4 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 5 & -1 \\ 4 & 1 \end{bmatrix}$, find AB . 5
- (c) Solve the equations $x + y = 0$, $y + z = 1$ and $x + z = 3$ for y by Cramer's rule. 5
- (d) If $A = \begin{bmatrix} 3 & 1 & 2 \\ -2 & 1 & 1 \\ 3 & 0 & 2 \end{bmatrix}$ find A^{-1} . 6
2. (a) Evaluate $\begin{vmatrix} 2 & 3 & -1 \\ 3 & -2 & 1 \\ 1 & 1 & 2 \end{vmatrix}$ 4
- (b) If $A = \begin{pmatrix} -1 & 0 \\ 5 & 3 \end{pmatrix}$ and $B = \begin{pmatrix} 3 & 5 \\ 2 & 4 \end{pmatrix}$ prove that $\text{adj}(AB) = [\text{adj}(B) \text{adj}(A)]$. 5
- (c) Verify whether $AB = BA$ for the matrices
 $A = \begin{bmatrix} 1 & 0 & 5 \\ -1 & 2 & 1 \\ 5 & 4 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & -1 & 4 \\ 0 & -1 & 1 \\ 2 & 4 & -2 \end{bmatrix}$. 5
- (d) Find the characteristic equation and eigen values for the matrix $\begin{bmatrix} 2 & -1 \\ -3 & 1 \end{bmatrix}$. 6

ough the points (2, 4) and (8, 7). 4

pe form of the straight line and find the 5

ough the point (5, 6) and slope of 3 units. 5

whose x-intercept and y-intercept are 3 5

andard form of it. 6

s $x + 3y + 1 = 0$ and $2x - y + 4 = 0$. 6

line which is making an angle of 30° with 2

cept of the line $3x - 2y = 6$. 2

e which has an angle of inclination 45° with 5

writing its standard form. 5

line. Find the equation of the straight line 5

nd (5, 4). 5

ne passing through the points (-3, 2) and 6

= 0. 6

2

2

5

5

6

$30 = \frac{1}{16}$.

6. (a) Find the value of $\cos 75^\circ$.
- (b) Simplify

$$\frac{\sin(-\theta)}{\sin(\pi - \theta)} - \frac{\tan\left(\frac{\pi}{2} - \theta\right)}{\cot(\pi - \theta)} + \frac{\cos\left(\frac{\pi}{2} + \theta\right)}{\cos\left(\frac{3\pi}{2} - \theta\right)}$$

- (c) If $\tan A = \frac{1}{3}$; $\tan B = \frac{1}{2}$, find $\tan(A + B)$.
- (d) Without using calculator and table find the value of $\sin 600^\circ \cos 330^\circ + \cos 120^\circ \sin 150^\circ$.

SECTION - IV

7. (a) If $y = 3x^3 + 5 \log x - 2e^{3x} + \tan^{-1}x$ find $\frac{dy}{dx}$. 4
- (b) If $y = \frac{1 - \tan x}{1 + \tan x}$ find $\frac{dy}{dx}$. 5
- (c) If $y = (e^x - \sin^{-1}x + 4 \log x)^{10}$ find $\frac{dy}{dx}$. 5
- (d) If $S = t^3 - t^2 + 9t + 8$ where S is the distance travelled by particle in t seconds. Find the velocity and acceleration at $t = 2$ seconds. 6
8. (a) If $y = x^5 - 3e^{-x} + 2 \cos x + \sin^{-1}x$ find $\frac{dy}{dx}$. 4
- (b) If $y = x^2 \log(e^x)$ find $\frac{dy}{dx}$. 5
- (c) If $y = \tan^{-1}x$ show that $(1 + x^2)y_2 + 2xy_1 = 0$. 5
- (d) Find the equation of the tangent to the curve $y = 2x^3 - 5x^2 + 8x - 6$ at the point (1, -1). 6

SECTION - V

9. (a) Evaluate $\int \left(x^4 + \frac{2}{x} + e^x - 3 \operatorname{cosec}^2 x \right) dx$. 4
- (b) Evaluate $\int_0^{\pi/2} \sin^2 x \, dx$. 5
- (c) Evaluate $\int x \log x \, dx$. 5
- (d) Find the area bounded by the curve $y = x^2 + 1$, x -axis and the coordinates at $x = 1$; $x = 2$. 6
10. (a) Evaluate $\int_1^2 x^3 \, dx$. 4
- (b) Evaluate $\int \sin^6 x \cos x \, dx$. 5
- (c) Evaluate $\int x e^x \, dx$. 5
- (d) Find the volume generated by rotating the curve $y = \sqrt{x+2}$ about x -axis between $x = 0$ and $x = 2$. 6