3619 Code : 20SC01T

Register Number | | | | | | | | | | |

I Semester Diploma Examination, April/May-2021

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) 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 adj (AB) = [adj(B) 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**

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SECTION – II

3. (a) Find the slope of the line passing through the points (2, 4) and (8, 7).

(b) Write the standard form of point-slope form of the straight line and find the equation of the straight line passing through the point (5, 6) and slope of 3 units.

(c) Find the equation of the straight line whose 'x'-intercept and y-intercept are 3 and 4 respectively by writing the standard form of it.

(d) Find the acute angle between the lines $x + 3y + 1 = 0$ and $2x - y + 4 = 0$.

4. (a) (i) Find the slope of the straight line which is making an angle of 30° with the x-axis.

(ii) Find the x-intercept and y-intercept of the line $3x - 2y = 6$.

(b) Find the equation of the straight line which has an angle of inclination 45° with x-axis and y-intercept of 2 units by writing its standard form.

(c) Write the standard form of straight line. Find the equation of the straight line passing through the points (2, –3) and (5, 4).

(d) Find the equation of the straight line passing through the points (–3, 2) and perpendicular to the line $4x - y + 7 = 0$.

SECTION – III

5. (a) (i) Express $\frac{5\pi^C}{2}$ in degrees.

(ii) Express 105° in radians.

(b) Prove that :

$$\frac{\sin(A + B) + \sin(A - B)}{\cos(A + B) + \cos(A - B)} = \tan A.$$

(c) Prove that : $\sin 3\theta = 3 \sin \theta - 4 \sin^3 \theta$.

(d) Prove that : $\cos 20 \cos 40 \cos 60 \cos 80 = \frac{1}{16}$.

6. (a) Find the value of cos 75°. 4

(b) Simplify

$$\frac{\sin(-\theta)}{\sin(\pi-\theta)} - \frac{\tan\left(\frac{\pi}{2}-\theta\right)}{\cot(\pi-\theta)} + \frac{\cos\left(\frac{\pi}{2}+\theta\right)}{\cos\left(\frac{3\pi}{2}-\theta\right)}$$ 5

(c) If $\tan A = \frac{1}{3}$; $\tan B = \frac{1}{2}$, find $\tan(A + B)$. 5

(d) Without using calculator and table find the value of 6

$\sin 600° \cos 330° + \cos 120° \sin 150°$.

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

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SECTION – V

9. (a) Evaluate $\int \left(x^4 + \frac{5}{x} + e^x - 3\,\text{cosec}^2 x\right) dx$.

(b) Evaluate $\int_0^{\pi/2} \sin^2 x\, dx$.

(c) Evaluate $\int x \log x\, dx$.

(d) Find the area bounded by the curve $y = x^2 + 1$, x-axis and the coordinates $x = 1; x = 2$.

10. (a) Evaluate $\int_1^2 x^3\, dx$.

(b) Evaluate $\int \sin^6 x \cos x\, dx$.

(c) Evaluate $\int x e^x\, dx$.

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