

Register Number

Code : 20SC01T

I / II Semester Diploma Examination, May/June-2024

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-1

1) a) If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ then find $A + A^T$ 4

OR If $A = \begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 1 \\ 3 & -2 \end{bmatrix}$ then find $A + B$

b) Find the Inverse of matrix $A = \begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix}$ 6

OR Find characteristic equation and its roots for the matrix $\begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$

c) Using crammer's rule solve the system of Equation

$$4x - 3y = 5 \text{ and } 3x + y = 7 \quad 5$$

OR Solve for x if $\begin{vmatrix} 1 & 2 & 1 \\ 3 & -1 & x \\ 2 & 3 & 2 \end{vmatrix} = 0$

d) If $A = \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix}$ $B = \begin{bmatrix} 3 & 1 \\ 1 & 2 \end{bmatrix}$ then find $(AB)^T$ 5

OR If $A = \begin{bmatrix} 2 & 1 \\ 4 & 0 \end{bmatrix}$ Verify $A (\text{Adj}A) = |A| I$ Where I is identity Matrix

SECTION-II

2) a) Find slope and y-intercept of the line $2x + 5y - 3 = 0$ 4

OR Write standard form of equation of straight line

i) general form ii) point -slope form.

b) Find the equation of the straight line passing through the points (2, -3) and (1,0) 6

OR Find the equation of straight line whose x-intercept is 3 and y-intercept is 4.

c) Find the Angle between the lines

$$3x + y + 5 = 0 \text{ and } 2x + 4y - 7 = 0 \quad 5$$

OR Find the equation of straight line passing through (1,3) and slope 2

d) Find the equation of straight line passing through (3,2) and parallel to the line $5x + 2y - 3 = 0$ 5

OR Show that the lines $3x - 2y + 2 = 0$ and $2x + 3y + 7 = 0$ are perpendicular

SECTION-III

3) a) Convert (i) 120° into radian measure

and (ii) $\frac{11\pi}{3}$ radian into degree 4

OR Find the value $\cos 75^\circ$ using compound angle.

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

5

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

c) Find the value of $\sin 600^\circ \cos 330^\circ - \cos 120^\circ \sin 150^\circ$

using ratios of allied angles.

6

OR Simplify
$$\frac{\cos(360^\circ - A)\tan(360^\circ + A)}{\cot(270^\circ - A)\sin(90^\circ + A)}$$

d) Show that $\cos 20^\circ \cos 40^\circ \cos 80^\circ = \frac{1}{8}$

5

OR If $\tan A = \frac{1}{2}$ and $\tan B = \frac{1}{3}$ Find the value $\tan(A + B)$

SECTION-IV

4) a) If $y = x^3 + 5\log x - 2e^x + \sin x$ find $\frac{dy}{dx}$

4

OR Differentiate $x^2 \sin x$ w.r.t x

b) Find the derivative of $\frac{1+x}{1-x}$ w.r.t x

5

OR If $y = \tan^{-1} x$ Prove that $(1 + x^2) \frac{d^2 y}{dx^2} + 2x \frac{dy}{dx} = 0$

c) The distance travelled by a particle in t second is given by

$$S = 2t^3 - t^2 + 5t - 3,$$

find the velocity and acceleration when $t = 1$ second.

6

OR Find the maximum and minimum value of the function

$$2x^3 - 21x^2 + 36x + 50$$

4) d) The equation of tangent to the curve $y = 2x^2 + x - 1$ at (1,1) 5

OR If $y = \log x$ then prove that $x \frac{d^2y}{dx^2} + \frac{dy}{dx} = 0$

SECTION-V

5) a) Integrate $e^x + \frac{1}{x} + \cos x + x^3$ w.r.t x 4

OR Evaluate $\int x(1 + x^2)dx$

b) Find the area bounded by the curve $y = x^2 + 1$
along x-axis between $x=0$ and $x=1$ 6

OR Evaluate $\int \sin^4 x \cos x dx$

c) Find the volume of the solid generated by revolving
the curve $y^2 = x^2$ about x-axis between $x=1$ and $x=2$ 5

OR Evaluate $\int x e^x dx$

d) Evaluate $\int_0^1 (x^2 + 1)dx$ 5

OR Show that $\int_0^{\frac{\pi}{2}} \sin^3 x dx = \frac{2}{3}$

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