
Makeup Examination – Sept. 2023
I/II/IV Semester Diploma Examination

ENGINEERING MATHEMATICS (20SC01T)

(Exam Date / Time: 23rd Sep. 2023 / 2.00 PM)

Time: 3 hours

Max Marks: 100

- Instructions:** (1) Answer all questions.
 (2) Each section carries 20 marks.

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for solutions

Section-I

1. (a) If $A = \begin{bmatrix} 2 & 1 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$, then find $2A + 3B$. 4

OR

If $A = \begin{bmatrix} 3 & 2 \\ 2 & 0 \end{bmatrix}$ then find $A + A^T$ matrix .

(b) Find the characteristics roots of the matrix $A = \begin{bmatrix} 5 & 2 \\ 4 & 3 \end{bmatrix}$ 6

OR

Find the inverse of the matrix $A = \begin{bmatrix} \cos x & -\sin x \\ \sin x & \cos x \end{bmatrix}$

(c) Find the adjoint of the matrix $A = \begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix}$ 5

OR

Solve the equations $2x+y=1$; $3x+2y=1$ by using Cramer's rule.

(d) If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 1 \\ 3 & 4 \end{bmatrix}$, find AB matrix and also find $(AB)^T$ matrix. 5

OR

If $\begin{vmatrix} x & 2 \\ 3 & 4 \end{vmatrix} = \begin{vmatrix} 3 & 2 \\ 0 & x \end{vmatrix}$ find the value of x.

Section-II

2. (a) Find the equation of a straight line with slope 5 and y-intercept 3. 4

OR

Write the standard form of equation of straight line with

- a) One point (x_1, y_1) having slope m .
b) Two points (x_1, y_1) and (x_2, y_2) .
- (b) Find the equation straight line passing through two points $(3,4)$ and $(5,6)$ 6
OR
Find equation of straight line passing through the point $(1,2)$ which makes an angle 45° With positive direction of x - axis.
- (c) Find the acute angle between the lines $x-2y+1=0$ and $2x+6y-5=0$. 5
OR
Prove that the given straight lines $3x-4y-7=0$ and $9x-12y-11=0$ are parallel.
- (d) Find the equation of straight line parallel to $5x+6y-10=0$ and passing through the Point $(-3, 3)$ 5
OR
Find the equation of the line cutting off equal intercepts and passing through the point $(-2, 5)$

Section-III

3. (a) Convert 120° into radian and $\frac{3\pi}{2}$ into degree 4
OR
Prove that $\sin 2A = 2 \sin A \cos A$
- (b) Prove that $\tan(45^\circ + A) = \frac{1 + \tan A}{1 - \tan A}$ 6
OR
If $\tan A = \frac{5}{12}$ and $180^\circ < A < 270^\circ$ then find the value of $\sin A$ and $\cos A$
- (c) Simplify $\frac{\cos(360^\circ - A)\tan(360^\circ + A)}{\cot(270^\circ - A)\sin(90^\circ + A)}$ 5
OR
Prove that $\frac{1 - \cos 2A + \sin 2A}{1 + \cos 2A + \sin 2A} = \tan A$.
- (d) Show that $\cos 100^\circ + \cos 80^\circ = 0$ 5
OR
Show that $\cos 20^\circ \cos 40^\circ \cos 80^\circ = \frac{1}{8}$.

Section-IV

4. (a) If $y = x^3 + 3\cos x + 4e^x + 2$ then find $\frac{dy}{dx}$. 4

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OR

If $y = (x+1)(x-1)$ then find $\frac{dy}{dx}$.

- (b) Find the maximum and minimum value of a function $y = 2x^3 - 15x^2 + 36x + 6$ 6

OR

If $s = t^3 - 2t^2 + 6t + 8$ is the equation of motion of a particle in meters, find the acceleration at the end of 3 secs

- (c) If $y = a \cos mx + b \sin mx$ then prove that $\frac{d^2y}{dx^2} + m^2y = 0$. 5

OR

Find the derivative of a function $\frac{1 + \sin x}{1 - \sin x}$ w.r.t.x.

- (d) Find the equation of tangent to the curve $y = 1 - x^3$ at the point (2, 3) 5

OR

If $y = (1 + x^2) \tan^{-1} x$ then find $\frac{dy}{dx}$.

Section-V

5. (a) Evaluate $\int \tan^2 x dx$ 4

OR

(c) Integrate the function $\sin x + \frac{1}{x} + x^3 - 7$ w.r.t.x.

- (b) Find area bounded by the curve $y = x^2 + 2$, the x-axis and the ordinates at $x=1$ and $x=2$ 6

OR

(c) Find the volume of the solid generated by revolving the line $y^2 = 2x + 1$ about x-axis between the ordinates $x=0$ and $x=2$

- (c) Evaluate the indefinite integral $\int (x \sin x) dx$ using integration by parts. 5

OR

Evaluate $\int_0^1 \frac{(\tan^{-1} x)^4}{1+x^2} dx$

- (d) Evaluate the indefinite integral $\int \frac{x+1}{x^2+2x+1} dx$ using integration by substitution method. 5

OR

Evaluate $\int \sin^3 x dx$