



23005

BOARD DIPLOMA EXAMINATION, (C-23)

OCTOBER/NOVEMBER—2025

FIRST YEAR (COMMON) EXAMINATION

ENGINEERING MATHEMATICS—I

Time : 3 Hours]

[Total Marks : 80

PART—A

3×10=30

- Instructions :** (1) Answer **all** questions.
 (2) Each question carries **three** marks.

1. Find the domain and range of $\{(2,1), (5,1), (8,1), (11,1), (14,1), (17,1)\}$.
2. Resolve $\frac{x}{(x-1)(x-3)}$ into partial fractions.
3. If $A = \begin{bmatrix} 2 & 3 & -1 \\ 7 & 8 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 & 1 \\ 2 & -4 & -1 \end{bmatrix}$, then find $A + B$.
4. If $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$, then find $\det A$.
5. Prove that $\frac{\cos 16^\circ + \sin 16^\circ}{\cos 16^\circ - \sin 16^\circ} = \tan 61^\circ$
6. Prove that $\frac{\sin 2\theta}{1 + \cos 2\theta} = \tan \theta$.
7. Find the additive inverse of the complex number $(7 - 24i)$.

8. Find the equation of the straight line passing through the point (3, -4) and parallel to the line $x + 7y + 1 = 0$.
9. Evaluate $\lim_{x \rightarrow 0} \frac{\sin 7x}{x}$.
10. Find the derivative of $6x^2 + 12x - 13$ w.r.t. x .

PART—B

10×5=50

Instructions : (1) Answer *any five* questions.
(2) Each question carries **ten** marks.

11. Solve the equations by using Cramer's rule : $2x - y + 3z = 9$, $x + y + z = 6$ and $x - y + z = 2$.
12. (a) Prove that $\cos \theta + \cot(120^\circ + \theta) + \cos(120^\circ - \theta) = 0$.
(b) Prove that $\tan^{-1} 1 + \tan^{-1} 2 + \tan^{-1} 3 = \pi$.
13. (a) Solve $\sin^2 \theta - 2 \sin \theta + 1 = 0$, $\sqrt{3} \cos \theta + \sin \theta = \sqrt{2}$.
(b) Solve $\triangle ABC$ with $a = 2$, $b = 2\sqrt{3}$, $c = 4$.
14. (a) Find the equation of the circle having (6, 0) and (0, 8) as the end points of its diameter.
(b) Find the equation of the parabola whose focus is (1, -1) and directrix is $x - 2y + 1 = 0$.
15. (a) Find the derivative of $\log x + 2 \tan^{-1} x + 8e^{-x}$ with respect to x .
(b) Find the derivative of $\frac{3x-1}{2x+1}$ with respect to x .

16. (a) If $y = x^{\sin x}$, then find $\frac{dy}{dx}$.
- (b) If $4(x, y) = x \sin y + y \cos x$, find $\frac{\partial u}{\partial x}$ and $\frac{\partial u}{\partial y}$.
17. (a) Find the slopes of the tangent and normal to the curve $y = x^3$ at $(2, 4)$
- (b) A particle moves along a line such that $S(t) = t^3 - 9t^2 + 24t - 8$. Find its initial velocity.
18. (a) Find the maximum or minimum value of the function $f(x) = ax^2 + bx + c$ ($a, b, c > 0$).
- (b) There is an error of 1% made in measuring the radius of a spherical balloon. Find approximate percentage error in its volume.

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