23005

C23-A-AA-C-M-MET-MNG-MRAC–102

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BOARD DIPLOMA EXAMINATION, (C-23)

MARCH/APRIL—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.

(3) Answer should be brief and straight to the point.

1. If $f(x)=x^2$, where x is an integer satisfying $-3 \le x \le 3$, then find its range.

2. Resolve $\frac{x}{(x-3)(x+2)}$ into partial fractions.

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

4. If $A=\begin{bmatrix}2 & -4\\ -3 & 3\end{bmatrix}$, then find $A+A^T$.

5. Prove that $\frac{\cos 36^\circ + \sin 36^\circ}{\cos 36^\circ - \sin 36^\circ} = \tan 81^\circ$

6. Prove that $\frac{1+\cos 2\theta}{\sin 2\theta} = \cot\theta$

7. Find the multiplicative inverse of the complex number $(3+4i)$.

8. Find the distance between the parallel lines $2x+3y+5=0$ and $2x+3y+9=0$

9. Evaluate $\lim_{x\to 2} \frac{x^5-32}{x-2}$

10. Find the derivative of $3x^2+4x-5$ w.r.t. *x*.

PART—B

10×5=50

Instructions : (1) Answer *any* **five** questions.

(2) Each question carries **ten** marks.

(3) Answer should be comprehensive and criteria for valuation is the content but not the length of the answer.

11. Solve the equations $2x-y+3z=8, -x+2y+z=4$ and $3x+y-4z=0$ by using Cramer's rule.

12. *(a)* Prove that $\frac{\sin 12A+\sin 6A}{\cos 12A+\cos 6A}=\tan 9A$

(b) Prove that $\tan^{-1}\left(\frac{1}{2}\right)+\tan^{-1}\left(\frac{1}{3}\right)=\frac{\pi}{4}$.

13. *(a)* Solve $\cos^2\theta-2\cos\theta+1=0$

(b) Find the area of ΔABC if $a=5, b=7$ and $C=30^\circ$

14. *(a)* Find the centre and radius of the circle $x^2+y^2+4x-6y-20=0$

(b) Find the vertex, equation of axis, focus and equation of latus rectum of the parabola $y^2 = 32x$.

15. (a) Find the derivative of $4\sin x + \log x + 2\sec x + 5\tan x$ w.r.t. x.

(b) Find the derivative of $x^2 e^x$ with respect to x.

16. (a) If $y = x^x$, then find $\frac{dy}{dx}$.

(b) Find $\frac{\partial u}{\partial x}$ and $\frac{\partial u}{\partial y}$ for $u(x, y) = x\sin y + y\cos x$.

17. (a) Find the equations of tangent and normal to the curve $y = x^2 - 3x - 1$ at $(1, -3)$.

(b) If $s(t) = 25t + t^3$ is the displacement of a particle, then find its velocity and acceleration at $t = 2\,\text{sec}$.

18. (a) Find the maximum or minimum value of the function $f(x) = x^2 - 4x + 4$.

(b) The radius of a circular plate is measured with an error of 2%, find the approximate percentage error in its area.

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