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23006

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.

1. If $A = \{-1, 0, 1\}$ and $f : A \to B$ is a function such that $f(x) = x^2 + 1$, then find the range of f.

2. Resolve $\frac{x}{(\quad+1)(\quad-8)}$ into partial fractions.

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

4. If $A = \begin{bmatrix} & \\ & \end{bmatrix}$, then find adj A.

5. Prove that $\frac{\cos 6^\circ - \sin 6^\circ}{+} =$

6. Find the value of $\sin 15^\circ$

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7. Find the modulus of the complex number $(3+i)(2-7i)$.

8. Find the equation of the straight line passing through the points $(1, 2)$ and $(3,-4)$.

9. Evaluate $\lim_{x\to 0} \frac{\sin 5x}{\sin 3x}$.

10. Find the derivative of $5x^2 - 9x + 2$ 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 : $3x + 2y + 2z = 5$, $2x + y - z = 1$ and $x + y - z = 0$.

12. *(a)* Prove that $\sin 50° - \sin 70° + \sin 10° = 0$

(b) Prove that $\tan^{-1}\left(\frac{1}{2}\right) - \tan^{-1}\left(\frac{1}{5}\right) = \tan^{-1}\left(\frac{3}{11}\right)$

13. *(a)* Solve $2\cos^2\theta - 3\cos\theta + 1 = 0$.

(b) Find the area of the $\triangle ABC$ when $a = 3,\ b = 6,\ c = 7$.

14. *(a)* Find the equation of the circle having (1,2) and (–2,3) as end the points of its diameter.

(b) Find the equation of the parabola whose focus is (5,0) and directrix is $x + y + 1 = 0$.

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15. *(a)* Find the derivative of $3\sin x - \cos x + \log x$ with respect to x.

(b) Find the derivative of $x \log x$ with respect to x.

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

(b) If $y = a\cos x + b\sin x$, then prove that $\frac{d^2y}{dx^2} + y = 0$.

17. *(a)* Find the slopes of the tangent and normal to the curve $y = x^2 + 2$ at (0,2).

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

18. *(a)* Find the maximum or minimum value of the function $f(x) = (x-2)(2x+1)$.

(b) The side of a square plate is measured as 5 cm instead of 5·03 cm. Find approximate percentage error in its perimeter.

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