C23-AEI-BM-CH-CHST-CHOT
-CHPC- CHPP-EE-EEVT-TT–102

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 $\dfrac{x}{(x+1)(x-8)}$ into partial fractions.

3.   If $A = \begin{bmatrix} 2 & 4 & -1 \\ 4 & 4 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 4 & 0 & 1 \\ 2 & -4 & -4 \end{bmatrix}$, then find $A - B$.

4.   If $A = \begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix}$, then find adj A.

5.   Prove that $\dfrac{\cos 6° - \sin 6°}{\cos 6° + \sin 6°} = \tan 39°$

6.   Find the value of $\sin 15°$

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 $\lim\limits_{x \to 0} \dfrac{\sin 5x}{\sin 3x}$.

10. Find the derivative of $5x^2 - 9x + 2$ w.r.t. x.

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PART—B

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$10 \times 5 = 50$

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 $\tan^{-1}\left(\dfrac{1}{2}\right) - \tan^{-1}\left(\dfrac{1}{5}\right) = \tan^{-1}\left(\dfrac{3}{11}\right)$

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 $x + y + 1 = 0$.

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 $\dfrac{dy}{dx}$.

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

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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