



**C16-COMMON-102**

**6002**

**BOARD DIPLOMA EXAMINATION, (C-16)**

**JULY—2023**

**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. Resolve  $\frac{x}{(x+1)(x+3)}$  into partial fractions.
2. If  $A = \begin{vmatrix} 1 & 2 \\ 2 & 3 \end{vmatrix}$  and  $B = \begin{vmatrix} 4 & 1 \\ 3 & 2 \end{vmatrix}$ , then find  $3A+5B$ .
3. Evaluate  $\begin{vmatrix} 1 & 1 & 2 \\ 3 & 0 & 4 \\ 4 & 2 & 5 \end{vmatrix}$
4. Prove that  $\frac{\cos 11^\circ + \sin 11^\circ}{\cos 11^\circ - \sin 11^\circ} = \tan 56^\circ$
5. Prove that  $\frac{\sin 2^\circ}{1 + \cos 2^\circ} = \cot 1^\circ$

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6. If  $z = 3 - 4i$ , find  $z + z^-$  and  $z \bar{z}$ .

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7.\* Find the equation of the line passing through the points  $(1, -2)$ ,  $(-2, 3)$ .

8. Find the distance between the parallel lines  $3x + 4y - 6 = 0$  and  $3x + 4y + 2 = 0$ .

9. Evaluate  $\lim_{x \rightarrow 0} \frac{\tan 121x}{\tan 11x}$

10. Find  $\frac{dy}{dx}$ , if  $y = 3 \cos x + 2 \log x + 5$

## PART—B

10×5=50

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

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

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

11. (a) Solve the system of equations  $2x - 3y + z = -1$ ,  $x + 4y - 2z = 3$ ,  $4x - y + 3z = 11$  by Cramer's rule.

(b) If  $A = \begin{vmatrix} 1 & 2 \\ 4 & 3 \end{vmatrix}$  and  $B = \begin{vmatrix} 5 & 3 \\ 2 & 0 \end{vmatrix}$ , show that  $(AB)^T = B^T A^T$ .

12. (a) Prove that  $\frac{\cos 3A + \cos A}{\sin 3A + \sin A} = \cot 2A$

(b) Prove that  $\tan^{-1} \frac{1}{3} + \tan^{-1} \frac{1}{8} = \tan^{-1} \frac{1}{5}$

13. (a) Solve  $2\cos^2 \theta - \sqrt{3} \cos \theta = 0$

(b) Solve the  $\triangle ABC$  with  $a = 1$ ,  $b = 2$ ,  $c = \sqrt{3}$ .

14. (a) Find the equation of the circle whose centre is  $(-1, 2)$  and radius is 3.

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- \* (b) Find the vertex, focus, latus rectum, axis and length of the latus rectum of the parabola  $(y - 2)^2 = 16(x + 1)$ .

15. (a) Find  $\frac{dy}{dx}$ , if  $y = e^x(x^2 + 3x + 5)$

(b) Find  $\frac{dy}{dx}$ , if  $y = \cos^{-1}(4x^3 + 3x)$

16. (a) Find  $\frac{dy}{dx}$ , if  $x = at^2$  and  $y = 2at$

(b) Find  $\frac{dy}{dx}$ , if  $y = \sqrt{\sin x + \sqrt{\sin x + \sqrt{\sin x + \dots}}}$

17. (a) Find the lengths of the tangent, normal, sub-tangent and sub-normal for the curve  $y = x^3 - 3x + 2$  at  $(0, 2)$ .

(b) A particle is moving along a straight line according to the law  $s = 2t^3 - 3t^2 + 15t + 18$  ( $t$  in sec). Find its velocity when its acceleration is zero.

18. (a) Find the maximum and minimum values of  $2x^3 - 9x^2 + 12x + 10$ .

(b) If the length of a simple pendulum is decreased by 2%, find the percentage error in its period  $T$ , where  $T = 2\sqrt{\frac{l}{g}}$  and  $g$  is a constant.

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