



C16-COMMON-102

6002

BOARD DIPLOMA EXAMINATION, (C-16)

JANUARY/FEBRUARY—2022

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  $\frac{1}{(x-1)(x-2)}$  into partial fractions.
2. If  $A = \begin{bmatrix} 1 & -1 \\ 1 & 1 \end{bmatrix}$  and  $B = \begin{bmatrix} 2 & 3 \\ 1 & 3 \end{bmatrix}$ , then find  $A + B$  and  $A - B$ .
3. If  $A = \begin{bmatrix} -1 & 1 \\ 1 & 2 \end{bmatrix}$ , then find Adjoint of  $A$ .
4. Show that  $\frac{\cos^2 A}{\sin^2 A} = \frac{\cot A}{2}$ .
5. Show that  $\sin 70^\circ \cos 10^\circ - \cos 70^\circ \sin 10^\circ = \frac{\sqrt{3}}{2}$ .
6. Find the modulus of  $z = -1 - 3i$ .
7. Find the slope of line joining two-points  $(1, 0)$  and  $(0, 2)$ .

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8. Find  $x$  and  $y$  intercepts of the straight line  $\frac{x}{2} + \frac{y}{3} = 1$ .
9. Evaluate  $\lim_{\theta \rightarrow 0} \frac{\sin m\theta}{\tan n\theta}$ .
10. If  $y = e^x + \log x + x$ , then find  $\frac{dy}{dx}$ .

**PART—B**

10×5=50

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

11. (a) Solve the following system of linear equations by using Cramer's rule :

$$3x + y + 2z = 3, \quad 2x - 3y - z = -3 \quad \text{and} \quad x + 2y + z = 4$$

(b) If  $A = \begin{bmatrix} 1 & -1 & 0 \\ 2 & 1 & 3 \\ 4 & 1 & 8 \end{bmatrix}$  and  $B = \begin{bmatrix} 4 & 1 & 0 \\ 2 & -3 & 1 \\ 1 & 1 & -1 \end{bmatrix}$  show that  $(A + B)^T = A^T + B^T$ .

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

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

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

(b) In a  $\triangle ABC$ , show that  $(b - c)\sin A + (c - a)\sin B + (a - b)\sin C = 0$ .

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14. (a) Find the equation of the circle having (4,2) and (1,5) as the extremities of the diameter.
- (b) Find the eccentricity, foci, length of major and minor axes, vertices of an ellipse  $\frac{x^2}{25} + \frac{y^2}{16} = 1$ .
15. (a) If  $y = \sqrt{\sin x + \sqrt{\sin x + \sqrt{\sin x + \dots \infty}}}$  times, then find  $\frac{dy}{dx}$ .
- (b) If  $y = \sin^{-1}(3x - 4x^3)$ , then find  $\frac{dy}{dx}$ .
16. (a) If  $x = at^2$  and  $y = 2at$ , then find  $\frac{dy}{dx}$ .
- (b) If  $u = x^3 + y^3$ , then find  $\frac{\partial^2 u}{\partial x^2}$  and  $\frac{\partial^2 u}{\partial y^2}$ .
17. (a) Find the lengths of tangents, normal, sub-tangent and sub-normal to the curve  $y = x^3$  at (1,1).
- (b) Find the maximum and minimum values of  $4x^3 - 18x^2 + 24x - 7$ .
18. (a) If  $s = t^2 - 4t + 3$  then find the velocity and acceleration when  $t = 4$  secs,  $s$  is displacement.
- (b) If the radius of a spherical balloon is increased by 0.1%, then find the approximate increase in its volume.

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