



C16-COMMON-102

6002

BOARD DIPLOMA EXAMINATION, (C-16)

OCTOBER/NOVEMBER—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 $\frac{1}{(x-1)(x-2)}$ into partial fractions.

2. If $\begin{pmatrix} 9 & -1 & 4 \\ -2 & 1 & 3 \end{pmatrix} = A + \begin{pmatrix} 1 & 2 & -1 \\ 0 & 4 & 9 \end{pmatrix}$, then find the matrix A.

3. Find the value of the determinant $\begin{vmatrix} 0 & 2 & 0 \\ 2 & 3 & 4 \\ 4 & 5 & 6 \end{vmatrix}$.

4. Prove that $\sin 70^\circ \cos 10^\circ - \cos 70^\circ \sin 10^\circ = \frac{\sqrt{3}}{2}$.

5. If $\cos A = \frac{4}{5}$ and A is acute, then find the value of $\tan 2A$.

6. If $z_1 = 3 - 5i$ and $z_2 = -6 - 2i$, then find $z_1 + z_2$ and $z_1 - z_2$.

7. Find the equation of a straight line passing through the point (4,3) and having slope 2.

8. Find the length of perpendicular from the origin to the line $4x + 3y - 2 = 0$.
9. Evaluate $\lim_{x \rightarrow 3} \frac{x^2 - 9}{x - 3}$.
10. Find the derivative of $x^3 + e^x + x^x$ w.r.t. 'x'.

PART—B

10×5=50

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

11. (a) Find the inverse of the matrix $\begin{pmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 1 & 1 & 2 \end{pmatrix}$.
- (b) Solve the system of linear equations $2x + y = 2$, $-4y + z = 0$ and $4x + z = 6$ by Cramer's rule.
12. (a) Prove that $\sin 78^\circ - \sin 18^\circ + \cos 132^\circ = 0$.
- (b) Prove that $\tan^{-1}\left(\frac{1}{3}\right) + \tan^{-1}\left(\frac{1}{7}\right) = \tan^{-1}\left(\frac{1}{2}\right)$.
13. (a) Solve $2\cos^2\theta - 3\cos\theta + 1 = 0$.
- (b) In any $\triangle ABC$, prove that $\sin A + \sin B + \sin C = \frac{S}{R}$.
14. (a) Find the equation of the circle passing through the points (0,0), (1,0) and (0,1).
- (b) Find the coordinates of the vertex and focus, the equations of the axis and directrix and length of the latus-rectum of the parabola $y^2 = 8x$.

15. (a) Find $\frac{dy}{dx}$, If $x = a\cos\theta$ and $y = b\sin\theta$.
(b) Differentiate x^x w.r.t. 'x'.
16. (a) If $y = ae^x + be^{-x}$, then show that $\frac{d^2y}{dx^2} - y = 0$.
(b) If $u = \sin^{-1}\left(\frac{x^2 + y^2}{x + y}\right)$, then prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \tan u$.
17. (a) Find the equation of the tangent and the normal to the curve $y = x^3 - 2x + 7$ at the point (1,6).
(b) The radius of circle is increasing at the rate of 0.7 cm/sec. What is the rate of increase of its circumference?
18. (a) Find the numbers whose sum is 16 and the sum of whose squares is minimum.
(b) If the length l of a simple pendulum is decreased by 2%, then find the percentage decrease in its period T , where $T = 2\pi\sqrt{\frac{l}{g}}$ and g is a constant.

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