



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 $A = \begin{bmatrix} 1 & 2 \\ 2 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 4 & 1 \\ 3 & 2 \end{bmatrix}$, 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 $z - z^{-}$.

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 $A = \begin{bmatrix} 1 & 2 \\ 4 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 5 & 3 \\ 2 & 0 \end{bmatrix}$, 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 $T = 2\pi\sqrt{\frac{l}{g}}$ and g is a constant.

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