



C16-C-102/C16-CM-102

6017

BOARD DIPLOMA EXAMINATION, (C-16)

OCT/NOV—2017

DCE—FIRST YEAR 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 $\frac{2x-1}{(x-1)(2x-3)}$ into partial fractions.

2. Compute $A^2 - 3A$, if $A = \begin{bmatrix} 1 & 3 \\ 2 & 1 \end{bmatrix}$.

3. Evaluate $\begin{vmatrix} g & f & c \\ a & h & g \\ h & b & f \end{vmatrix}$ using Laplace's expansion.

4. Prove that $\tan 75^\circ \cot 75^\circ = 4$.

5. Prove that $\frac{\tan 2\theta}{1 - \sec 2\theta} = \tan \theta$.

6. Find the real and imaginary parts of $\frac{4-2i}{1-2i}$.

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7. Find the perpendicular distance of the point (3, 5) from the line $3x + 4y - 26 = 0$.
8. Find the equation of straight line passing through (3, -1) and parallel to $5x - 7y - 3 = 0$.
9. Find the limit of $\frac{\sin 7x}{\tan 5x}$ as $x \rightarrow 0$.
10. Find the derivative of $x \cot^{-1} x$ 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 $\begin{bmatrix} 2 & 2 & 4 \\ 3 & 3 & 1 \\ 1 & 4 & 1 \end{bmatrix}$.
- (b) Solve the equations $x + y + z = 2$, $2x + 3y + 4z = 4$ and $3x + y + z = 8$ by Cramer's rule.
12. (a) Prove that $\frac{\sin 70^\circ}{\cos 50^\circ} = \frac{\sin 50^\circ}{\cos 70^\circ} = \frac{1}{\sqrt{3}}$.
- (b) Prove that $\cos^{-1} \frac{33}{65} = \sin^{-1} \frac{5}{13} = \sin^{-1} \frac{3}{5}$.
13. (a) Solve $\sin^{-1} x + \cos^{-1} x = \sqrt{2}$.
- (b) If $a \cos A = b \cos B$, then prove that the triangle ABC is either isosceles or right-angled triangle.

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14. (a) Find the equation of the parabola whose focus is (1, 2) and whose directrix is the line $3x + 4y - 5 = 0$.
- (b) Find the equation of the circle passing through the points (0, 0), (1, 0) and (0, 1).

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15. (a) Find the derivative of $\log(\cos(\log x))$ w.r.t. x .

(b) If $x = a(\sin \theta)$, $y = a(1 - \cos \theta)$, then find $\frac{d^2y}{dx^2}$.

16. (a) Find the derivative of $\cos^{-1}(4x^3 - 3x)$ w.r.t. x .

(b) If $u = \log(x^2 + y^2 + z^2)$, then prove that

$$x \frac{u}{x} + y \frac{u}{y} + z \frac{u}{z} = 2$$

17. (a) Find the lengths of tangent, normal, subtangent and subnormal of the curve $y = x^3 - 2x^2 + 4$ at the point (3, 13).

(b) A circular patch of oil spreads out on water and the area is growing at the rate of 3 sq.cm/sec. How fast does the radius increase, when the radius is 4 cm?

18. (a) Find the dimensions of a rectangle of maximum area having a perimeter of 26 ft.

(b) The radius of spherical balloon is increased by 2%. Find the approximate the percentage increase in its surface area.

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