



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  $\begin{pmatrix} 2 & 2 & 4 \\ 3 & 3 & 1 \\ 1 & 4 & 1 \end{pmatrix}$ .

(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  $\frac{\sin 70^\circ \cos 50^\circ}{\cos 50^\circ \cos 70^\circ} = \frac{1}{\sqrt{3}}$ .

(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.

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).

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

(b) If  $x = a(\sin t)$ ,  $y = a(1 - \cos t)$ , 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 percentage increase in its surface area.

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