



c09-c-102

**3012**

**BOARD DIPLOMA EXAMINATION, (C-09)**

**OCT/NOV—2013**

**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.

(3) Answers should be brief and straight to the point and shall not exceed *five* simple sentences.

1. Divide  $(9x^2 - 3x - 1)$  by  $(x - 3)$ .

2. Simplify  $2[ \{ (x - y) \} ] [ 2\{ 2( a) \} ]$  by removing the brackets.

3. Resolve  $\frac{1}{(x - 2)(x - 3)}$  into partial fractions.

4. Prove that  $\cos 20^\circ \cos 30^\circ \cos 40^\circ \cos 80^\circ = \frac{\sqrt{3}}{16}$ .

5. Prove that  $\tan 8A = \tan 6A + \tan 2A = \tan 8A \cdot \tan 6A \cdot \tan 2A$ .

6. Find the modulus and amplitude of the complex number  $\sqrt{3} - i$ .

\*

7. Find the perpendicular distance from the point (5, -7) to the line  $3x + 5y + 7 = 0$ .
8. Find the centre and radius of the circle  $25x^2 + 25y^2 + 20x + 30y + 12 = 0$ .
9. Find the value of  $\lim_{n \rightarrow \infty} \frac{1^2 + 2^2 + 3^2 + \dots + n^2}{n^3}$ .
10. Find the derivative of  $\cos^{-1}(4x^3 - 3x)$  w.r.t.  $x$ .

**PART—B**

10×5=50

- Instructions :** (1) Answer any **five** questions.  
(2) Each question carries **ten** marks.  
(3) Answers should be comprehensive and the criteria for valuation is the content but not the length of the answer.

11. (a) Show that

$$\begin{vmatrix} a & b & 2c & a & b \\ & c & & b & c & 2a & b \\ & & c & & a & c & a & 2b \end{vmatrix} = 2(a + b + c)^3$$

(b) Find the adjoint of the matrix

$$\begin{bmatrix} 1 & 2 & 2 \\ 2 & 3 & 0 \\ 0 & 1 & 2 \end{bmatrix}$$

12. (a) Solve  $2 \cos^2 \theta + 3 \cos \theta + 1 = 0$ .

(b) Solve the  $\triangle ABC$  if  $b = 1, c = \sqrt{3}, A = 30^\circ$ .

\*

13. (a) Show that

$$\frac{\cos 7A}{\sin 7A} - \frac{\cos 5A}{\sin 5A} = \cot 6A$$

(b) Show that  $\tan^{-1} \frac{3}{4} + \tan^{-1} \frac{5}{12} = \tan^{-1} \frac{56}{33}$ .

14. (a) Find the equation of the conic whose focus is at (1, 2) and directrix  $2x - y - 1 = 0$  with eccentricity  $\sqrt{3}$ .

(b) Find the centroid of the triangle formed by the points (1,1,1), (1,-1,1) and (-7,-3,-5).

15. (a) Find the vertex, focus, equation of directrix, equation of axis and length of latus rectum of the parabola represented by the equation  $(y - 4)^2 = 20(x - 1)$ .

(b) Find the equation of the ellipse passing through (1,4), (-6,1) with axes as coordinate axes.

16. (a) If  $u = x^2y - y^2z + z^2x$ , then show that

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

(b) Differentiate  $(\sin x)^{\cos x}$  w.r.t.  $x$ .

\*

17. (a) Find the angle between the curves  $x^2 + y^2 = 1$  and  $xy = \sqrt{2}$  at  $(\sqrt{2}, 1)$ .

(b) A man of 2 m tall is approaching a lamppost at the rate of 0.5 m/sec. If the lamp is situated at a height of 8 m, then find the rate at which the length of the shadow is decreasing.

\*

**C09-C-102**

- 18.** (a) The running track of 44 m is to be laid out enclosing a football field, the shape of which is a rectangle with semicircle at each end. Find the lengths of the sides of the rectangular portion so that the area of rectangular portion is maximum.
- (b) Find the approximate error in the volume of a cube given that an error of 0.1 cm is made in measuring its side of 10 cm.

\*\*\*