



c09-c-102

3012

BOARD DIPLOMA EXAMINATION, (C-09)

OCT/NOV—2014

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. Solve $2x - 3/x = 4$.

2. If $x = a/b$, $y = b/c$ and $z = c/a$, then find the value of $2x - 3y + 4z$.

3. Resolve $\frac{1}{(x-9)(x-7)}$ into partial fractions.

4. Show that

$$\frac{\cot \theta - \tan \theta}{\cot \theta + \tan \theta} = \sec^2 \theta$$

5. Find the additive and multiplicative inverse of $\frac{2i}{1-2i}$.

6. Prove that

$$\frac{\cos 37^\circ - \sin 37^\circ}{\cos 37^\circ + \sin 37^\circ} = \cot 8^\circ$$

- * 7. Find the equation of the circle with $(-5, 1)$ and $(3, -7)$ as end points of a diameter.
8. Find the intercepts made by the straight line $13x - 7y - 11 = 0$ on the coordinate axis.
9. Differentiate $\sqrt{1 - \sin 2x}$ w.r.t. x .

10. Evaluate :

$$\lim_{x \rightarrow 1} \frac{x^2 - 3x + 2}{x^2 - 4x + 3}$$

PART—B

10×5=50

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

11. (a) If $A = \begin{pmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{pmatrix}$, then find A^2 .

(b) Solve the equations

$$\begin{cases} x + 2y + 3z = 6 \\ 3x + 2y + z = 2 \\ 4x + 2y + z = 7 \end{cases}$$

* using Cramer's rule.

12. (a) Solve $\cos 2\theta + \cos 4\theta + \cos 6\theta + \cos 8\theta = 0$.

(b) Solve the $\triangle ABC$, if $a = 13$, $b = 14$ and $c = 15$.

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13. (a) Show that

$$\frac{\cos 3A}{\sin 3A} = \frac{\cos A}{\sin A} \cot 2A$$

- (b) Show that

$$\tan^{-1} \frac{2}{13} + \tan^{-1} \frac{5}{7} = \tan^{-1} \frac{79}{81}$$

14. (a) Find the vertex, focus, equation of directrix, equation of axis and length of latus rectum of the parabola represented by the equation $(x - 3)^2 = 16(y - 1)$.

- (b) Find the equation of the ellipse which passes through the points $(-2, 6)$ and $(3, 4)$ with axes as coordinate axes.

15. (a) Find the equation of the conic whose focus at $(3, 4)$ and directrix $3x - y - 8 = 0$ with eccentricity $\sqrt{2}$.

- (b) Find the distance between the points $(-2, 3, 4)$ and $(1, 2, 3)$.

16. (a) If $y = \sin x^{\sin x^{\sin x^{\sin x^{\dots}}}}$ times, then find $\frac{dy}{dx}$.

- (b) If $u = \tan^{-1} \frac{x^3 - y^3}{x - y}$, then show that

$$x \frac{u}{x} - y \frac{u}{y} = \sin 2u$$

17. (a) Show that the curves $4x^2 - 9y^2 = 72$ and $x^2 + y^2 = 5$ cut orthogonally.

- (b) Volume of a spherical balloon is increasing at a rate of 400 cubic cm/sec. Find the rate of increase of its radius and surface area when its radius is 15 cm.

18. (a) Find the maximum and minimum values of the function $2x^3 - 5x^2 - 4x + 7$.

- (b) The volume and pressure of a gas expanding adiabatically as $PV^{1.4} = K$, K being a constant. Find the approximate change in pressure when the volume increases by 1%.
