



C14-M/CHOT/RAC-102

4050

BOARD DIPLOMA EXAMINATION, (C-14)

MARCH/APRIL—2017

DME—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  $\frac{1}{(x-3)(x-1)}$  into partial fractions.

2. If  $A = \begin{pmatrix} 3 & 2 & 1 \\ 1 & 5 & 4 \\ 2 & 3 & 7 \end{pmatrix}$  and  $B = \begin{pmatrix} 1 & 2 & 1 \\ 2 & 1 & 2 \\ 1 & 2 & 1 \end{pmatrix}$ , find  $5A - 3B$ .

3. Using Laplace expansion, evaluate the determinant  $\begin{vmatrix} 0 & q & r \\ q & 0 & p \\ r & p & 0 \end{vmatrix}$ .

4. Show that  $\frac{\cos 37^\circ \sin 37^\circ}{\cos 37^\circ \sin 37^\circ} = \cot 8^\circ$ .

5. Show that  $\cos^4 A - \sin^4 A = \cos 2A$ .

6. Find the conjugate of the complex number  $(3 - 4i)(2 - 3i)$ .

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7. Find the perpendicular distance from the point (3, 2) to the line  $4x + 5y - 6 = 0$ .

8. Find the equation of the circle with centre (2, -3) and radius is 4.

9. Evaluate  $\lim_{x \rightarrow 0} \frac{\sin 3x}{\sin 5x}$ .

10. Differentiate  $\log(\cos x)$  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  $\begin{bmatrix} 2 & 2 & 4 \\ 2 & 3 & 2 \\ 1 & 1 & 1 \end{bmatrix}$ .

(b) Solve the equation by Cramer's method :

$$x + y + z = 9; 2x + 5y + 7z = 52; 2x + y + z = 0$$

12. (a) In any  $\triangle ABC$ , show that

$$\sin 2A + \sin 2B + \sin 2C = 4 \cos A \cos B \sin C$$

(b) Show that  $\tan^{-1} \frac{2}{3} + \tan^{-1} \frac{3}{4} = \tan^{-1} \frac{17}{6}$ .

13. (a) Solve  $\cos 5\theta = \cos 3\theta$ .

(b) In any  $\triangle ABC$ , show that  $(b + c) \cos A = a$ .

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14. (a) Find vertices, foci, directrices and the length of latus rectum of the hyperbola  $4x^2 - 9y^2 = 36$ .

(b) Find the equation of the ellipse whose focus (-1, 1) and directrix is  $x + y - 3 = 0$  and eccentricity is  $1/2$ .

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**15.** (a) Differentiate  $x^{\tan x}$  w.r.t.  $X$ .

(b) Find  $\frac{dy}{dx}$ , if  $x^2 + y^2 + 2axy = 1$ .

**16.** (a) Find  $\frac{dy}{dx}$ , if  $x = 4t^2$  and  $y = 8t$ .

(b) Differentiate  $\tan^{-1} \frac{2x}{1-x^2}$  w.r.t.  $\sin^{-1} \frac{2x}{1-x^2}$ .

**17.** (a) Find the equation of tangent and normal to the curve  $y = x^2 - 3x + 5$  at the point (2, 3).

(b) A circular metal plate expands by heat, so that its radius increases at the rate of 0.02 cm/sec. At what rate its area is increasing, when the radius is 20 cm?

**18.** (a) The sum of two numbers is 10. Find the numbers, so that the sum of their squares is a minimum.

(b) The circumference of a circle is measured as 28 cm with an error of 0.04 cm. Find the approximate percentage error in the area of the circle.

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