



C14-M-102/C14-CHOT-102/C14-RAC-102

4050

BOARD DIPLOMA EXAMINATION, (C-14)

MARCH/APRIL—2016

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

2. If  $A = \begin{pmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{pmatrix}$ , then show that  $A^2 - 4A - 5I = 0$ ,  $I$  is the unit matrix of order 3.

3. If  $A = \begin{pmatrix} 2 & 3 & 1 \\ 0 & 5 & 6 \\ 2 & 4 & 21 \end{pmatrix}$  and  $B = \begin{pmatrix} 1 & 2 & 3 \\ 1 & 0 & 2 \\ 1 & 1 & 1 \end{pmatrix}$ , find  $AB$  and  $BA$ .

4. Show that  $\tan 15^\circ \cot 15^\circ = 4$ .

5. Prove that  $\frac{1 - \cos 2A}{1 + \cos 2A} = \tan^2 A$ .

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6. Find the real and imaginary parts of  $\frac{3-2i}{7-4i}$ .
7. Find the perpendicular distance from the origin to the line  $3x+4y-26=0$ .
8. Find the point circle with centre  $(5, 2)$ .
9. Evaluate  $\lim_{x \rightarrow 0} \frac{\sin 8x}{\tan 5x}$ .
10. Differentiate  $e^{16x^2}$  w.r.t.  $x$ .

**PART—B**

10×5=50

**Instructions :** (1) Answer *any five* questions.

(2) Each question carries **ten** marks.

11. (a) Solve the following system of equations by matrix inversion method :

$$x+2y+3z=6; 3x+2y+4z=5; x+y+z=1$$

(b) Solve :

$$\begin{vmatrix} x & 1 & 2 & 3 \\ 1 & x & 2 & 3 \\ 1 & 2 & x & 3 \end{vmatrix} = 0$$

12. (a) If  $\sin x = \frac{3}{4}$  and  $\sin y = \frac{2}{5}$ , prove that

$$8 \tan \frac{x-y}{2} = 15 \tan \frac{x+y}{2}$$

(b) Prove that

$$\tan^{-1} \frac{1}{7} + \tan^{-1} \frac{3}{4} = \frac{\pi}{4}$$

13. (a) Solve  $8 \sin^3 \theta = \sin 3\theta$ .

(b) In  $\triangle ABC$ , if  $\frac{a}{b} = \frac{b}{c} = \frac{c}{a}$ , prove that  $C = 60^\circ$ .

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**14.** (a) Find the vertex, focus, directrix and latus rectum of the parabola  $x^2 = 32y$ .

(b) Find the eccentricity of the ellipse whose latus rectum is equal to half of the length of major axis.

**15.** (a) If  $y = \log(x + \sqrt{x^2 + 1})$ , find  $\frac{dy}{dx}$ .

(b) If  $y = x^{\sin x}$ , find  $\frac{dy}{dx}$ .

**16.** (a) If  $y = \tan^{-1} x$ , show that  $(1 + x^2)y_2 - 2xy_1 = 0$

(b) Verify Euler's theorem  $f(x, y, z) = x^2 + y^2 + z^2$ .

**17.** (a) Show that the curves  $y^2 = 4(x + 1)$  and  $y^2 = 36(9 - x)$  cut each other orthogonally.

(b) A spherical balloon is being inflated so that the radius is increasing at the rate of 3 cm/sec. Find the rate at which the volume is increasing when  $r = 10$  cm.

**18.** (a) The sum of two number is 26. Find them, if their product is to be maximum.

(b) If the length of simple pendulum  $l$  is decreased by 2%, find the percentage error in its period  $T$ , where  $T = 2\sqrt{\frac{l}{g}}$  and  $g$  is a constant.

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