



C09-CHOT-102/C09-M-102/RAC-102

3040

BOARD DIPLOMA EXAMINATION, (C-09)

OCT/NOV—2014

DME—FIRST YEAR EXAMINATION

ENGINEERING MATHEMATICS—I

Time : 3 hours]

[Total Marks : 80

PART—A

Instructions : (1) Answer **all** questions.

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

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

2. Express $x^2 - 3x + 5$ in the form $X^2 + A^2$.

3. Show that

$$u = \frac{x^7 + y^7}{x^2 + y^2}$$

is a homogeneous function of degree 5.

4. Prove that $\tan \frac{A}{4} = \frac{1 - \tan \frac{A}{2}}{1 + \tan \frac{A}{2}}$.

5. Prove that $\frac{1 + \cos 2\theta}{\sin 2\theta} = \tan \theta$.

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6. Find the additive inverse of $\frac{2i}{1-2i}$.

7. Find the derivative of $\sqrt{1-\sin 2x}$.

8. Evaluate

$$\lim_{n \rightarrow \infty} \frac{1^2 + 2^2 + 3^2 + \dots + n^2}{n^3}$$

9. Find the centre and radius of the circle $3x^2 + 3y^2 - 11x - 7y - 1 = 0$.

10. Find the distance between the parallel lines $3x - 2y - 9 = 0$; $6x - 4y - 24 = 0$.

PART—B

10×5=50

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

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

11. (a) Show that

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

(b) Solve the following equations by matrix inversion method :

$$\begin{aligned} x + y + z &= 6 \\ x + y + z &= 2 \\ 2x + y + z &= 1 \end{aligned}$$

12. (a) Solve $\cos \theta + \sqrt{3} \sin \theta = 1$.

(b) In any $\triangle ABC$, prove that $a^3 \sin(B-C) = 0$.

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13. (a) Show that

$$\sin^{-1} \frac{4}{5} + \sin^{-1} \frac{5}{13} = \cos^{-1} \frac{16}{65}$$

(b) Prove that

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

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

(b) Find the equation of the parabola whose focus is (3, 1) and vertex is (3, -2).

15. (a) Find the centroid of the tetrahedron formed by the points (1, -6, 7), (-3, 18, 17), (-5, 4, 5), (11, -4, 3).

(b) Find the equation of a rectangular hyperbola given that its focus is at (-1, -3) and directrix is the line $2x - y - 1 = 0$.

16. (a) Find $\frac{dy}{dx}$, if $y = \sqrt{\cos x + \sqrt{\cos x + \sqrt{\cos x + \dots}}}$

(b) If $u = x^2 + xy + y^2$, find $\frac{u}{x^2}$, $\frac{u}{y^2}$.

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

(b) Find the equations of tangent and normal to the curve $y = x^2 + 4x + 10$ at (1, 5).

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18. (a) If there is an error of 2% in measuring the side of a square plate, find the percentage error in its area.

(b) The sum of two numbers is 26. Find them if their product is to be maximum.
