



C16-M/CHOT/RAC-102

6052

BOARD DIPLOMA EXAMINATION, (C-16)

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

2. If $A = \begin{bmatrix} 4 & 2 & 6 \\ 1 & 4 & 5 \\ 2 & 3 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 1 & 2 \\ 1 & 3 & 4 \\ 2 & 3 & 4 \end{bmatrix}$, find X such that $A + B + X = 0$

3. Find the value of $\begin{vmatrix} a & h & g \\ h & b & f \\ g & f & c \end{vmatrix}$.

4. If $A + B = 45$, then show that $(1 + \tan A)(1 + \tan B) = 2$.

5. Show that $\frac{\sin 2}{1 + \cos 2} = \cot$.

6. Express $\frac{2-i}{3-4i}$ in the form of $A + iB$.

7. Find the equation of the line passing through the points (1, 2) and (-2, 3).

8. Find the perpendicular distance from the point (3, -2) to the line $3x - 4y - 10 = 0$.
9. Evaluate $\lim_{x \rightarrow 2} \frac{x^3 - 8}{x^5 - 32}$.
10. Differentiate $3 \cos x - 2 \log x - 21x - 5$.

PART—B

10×5=50

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

11. (a) Solve the equations $2x + y + 3z = 9$, $x + y + z = 6$, $x + y + z = 2$ by Cramer's method.

(b) Show that
$$\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{vmatrix} = (a-b)(b-c)(c-a).$$

12. (a) Prove that $\cos 20^\circ \cos 40^\circ \cos 80^\circ = 0$
(b) If $\tan^{-1} x + \tan^{-1} y + \tan^{-1} z = \frac{\pi}{2}$, then prove that $xy + yz + zx = 1$.

13. (a) Solve $2 \cos^2 \theta - 3 \cos \theta + 1 = 0$.
(b) Solve the triangle ABC given $a = 9$ unit, $B = 65^\circ$, $C = 15^\circ$.

14. (a) Find the equation of the circle with (2, 3) and (6, 9) as the end points of a diameter. Also find the radius, centre of the circle.
(b) Find vertices, foci, directrices and the length of latusrectum of the ellipse $4x^2 + 9y^2 = 36$.

15. (a) Find $\frac{dy}{dx}$, if $y = \log(\sin(\cos 3x))$.
(b) If $U(x, y) = \tan^{-1}(x/y)$, then find $\frac{u}{x}$, $\frac{u}{y}$.

16. (a) Differentiate $e^{\tan^{-1} x}$ w.r.t. $\tan^{-1} x$.
(b) If $y = \sin(\log x)$, then show that $x^2 y_2 + xy_1 - y = 0$.

17. (a) Find the length of tangent, normal, sub-tangent and sub-normal to the curve $y = x^3 - 2x + 5$ at the point (1, 4).
- (b) Each side of square is increasing at the rate of 1.5 cm/sec. Find the rate at which the area of the square increases, when the side is 12 cm.
18. (a) Find the dimensions of a rectangle of maximum area having a perimeter of 24 ft.
- (b) If the radius of a spherical balloon is increased by 0.1%, find the approximate percentage increases in its volume.

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