



* 6052 *

C16-M/CHOT/RAC-102

6052

BOARD DIPLOMA EXAMINATION, (C-16)

SEPTEMBER/OCTOBER - 2020

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 $\frac{1}{(x-2)(x-4)}$ into partial fractions.

2. If $A = \begin{pmatrix} 9 & 1 \\ 4 & 3 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & 5 \\ 6 & 11 \end{pmatrix}$, then find X such that $3A - 5B - 2X = 0$.

3. Evaluate $A A^T$, if $A = \begin{pmatrix} 2 & 4 \\ 5 & 3 \end{pmatrix}$.

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

5. Prove that $\frac{\sin 2A}{1 - \cos 2A} = \cot A$.

6. Find the modulus of the complex number $\frac{(3 - 4i)(2 - 3i)}{(5 - 7i)}$.

- * 7. Find the equation of the line passing through the points (1, 2) and (3, 5).
8. Find the perpendicular distance from (1, 3) to the line $2x + 3y + 3 = 0$.
9. Evaluate $\lim_{x \rightarrow 0} \frac{1 - \cos x}{x^2}$.
10. Find $\frac{dy}{dx}$, if $y = e^{2x} \log x$.

PART—B

10×5=50

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

11. (a) Solve the equations $x + 2y + z = 4$, $3x + y + 2z = 3$ and $2x + 3y + z = 3$ by Cramer's rule.
- (b) If $A = \begin{pmatrix} 1 & 2 \\ 3 & 1 \end{pmatrix}$, then show that $A^2 - 2A - 5I = 0$. Hence find A^{-1} .
12. (a) Show that $\sin A + \sin(120^\circ - A) + \sin(120^\circ + A) = 0$.
- (b) If $\tan^{-1} x + \tan^{-1} y + \tan^{-1} z = \frac{\pi}{2}$, then show that $xy + yz + zx = 1$.
13. (a) Solve $\cos 2\theta = \cos 8\theta = \cos 5\theta$.
- (b) In a triangle ABC, if $C = 60^\circ$, then prove that $\frac{a}{b} + \frac{b}{c} + \frac{c}{a} = 1$.
14. (a) Find the equation of the circle passing through the points (0, 0), (2, 0) and (0, 4).
- (b) Find the equation of the parabola whose focus is (1, 1) and equation of directrix is $2x + 3y + 7 = 0$.

- * 15. (a) Differentiate $\cos(\log(\sin 2x))$ with respect to x .
 (b) If $y = \sqrt{x \sqrt{x \sqrt{x \dots}}}$, then find $\frac{dy}{dx}$.
16. (a) If $x = a \cos^3 \theta$, $y = b \sin^3 \theta$, find $\frac{dy}{dx}$, d^2y / dx^2 .
 (b) Verify Euler's theorem $f(x, y) = x^2 + xy + y^2$.
17. (a) Find the equations of the tangent and normal to the curve $y = x^2 - 3x + 2$ at $(3, 2)$.
 (b) All edges of a cube are expanding at a rate of 1 cm/sec upon heating. Calculate the rate of increase of its volume and surface area when edge is 10 cm long.
18. (a) Show that the semi-vertical angle of the cone of maximum volume and of given slant height is $\tan^{-1} \sqrt{2}$.
 (b) Find the approximate value of $\sqrt{17}$ using differentiation.
