



C20-M/CHOT-102

7049

BOARD DIPLOMA EXAMINATION, (C-20)

JUNE/JULY—2022

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. Find the domain and range of the function defined by $f(x) = \frac{1}{x+2}$.

2. Resolve $\frac{5x+1}{(x-1)(x+2)}$ into partial fractions.

3. If $A = \begin{pmatrix} 3 & 9 & 0 \\ 1 & 8 & -2 \end{pmatrix}$ and $B = \begin{pmatrix} 4 & 0 & 2 \\ 7 & 1 & 4 \end{pmatrix}$, then find $A + B$.

4. Show that $\cos 100^\circ \cos 40^\circ + \sin 100^\circ \sin 40^\circ = \frac{1}{2}$.

5. Prove that $\frac{\cos 16^\circ + \sin 16^\circ}{\cos 16^\circ - \sin 16^\circ} = \tan 61^\circ$.

* 6. Find the additive and multiplicative inverses of the complex number $7 + 24i$.

7. Find the equation of the straight line passing through the point $(3, -4)$ and parallel to the line $x + 7y + 1 = 0$.

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8. Evaluate $\lim_{x \rightarrow 0} \frac{\sin 3x}{x}$.
9. Find the derivative of $6x^2 + 12x - 13$ w.r.t. x .
10. Find $\frac{dy}{dx}$, if $y = \sin^{-1} \sqrt{x}$.

PART—B

8×5=40

- Instructions :** (1) Answer **all** questions.
 (2) Each question carries **eight** marks.

- 11.** (a) Find the inverse of the matrix $\begin{pmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 1 & 1 & 2 \end{pmatrix}$.

(OR)

- (b) Solve the system of linear equations $2x - y + 3z = 9$, $x + y + z = 6$ and $x - y + z = 2$ using Cramer's rule.

- 12.** (a) Prove that $\cos^2 A + \cos^2 (60^\circ + A) + \cos^2 (60^\circ - A) = \frac{3}{2}$.

(OR)

- (b) If $\tan^{-1} x + \tan^{-1} y + \tan^{-1} z = \pi$, then prove that $x + y + z = xyz$.

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

(OR)

- (b) In any ΔABC , prove that $\sum a \sin(B - C) = 0$.

- 14.* (a) Find the equation of the circle with $(-5, 1)$ and $(3, -7)$ as the two end points of its diameter.

(OR)

- (b) Find the equation of the conic whose focus is $(1, -1)$, directrix is the line $x - y + 3 = 0$ and eccentricity is $\frac{1}{2}$.

15. (a) If $x = a \cos \theta$ and $y = b \sin \theta$, then find $\frac{d^2y}{dx^2}$.

(OR)

- (b) If $u(x, y) = \sin^{-1} \left(\frac{x^2 + y^2}{x + y} \right)$, then prove that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \tan u$.

PART—C

10×1=10

- Instructions :** (1) Answer the following question.
(2) The question carries **10** marks.

16. Find the lengths of the tangent, normal, sub-tangent and sub-normal to the curve $x^2 + y^2 - 6x + 8y = 0$ at the point $(7, -1)$.

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