7035

BOARD DIPLOMA EXAMINATION, (C-20)

MAY—2023

DEEE - 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. If $A = \{-1, 0, 1\}$ and $f : A \to \mathbb{R}$ is defined by $f(x) = x^3$, then prove that the function $f(x)$ is one-one.

2. Resolve $\dfrac{x}{(x+1)(x-8)}$ into partial fractions.

3. If $A = \begin{pmatrix} 1 & -2 & 3 \\ -4 & 2 & 5 \end{pmatrix}$ and $B = \begin{pmatrix} 2 & 3 \\ 4 & 5 \\ -2 & 1 \end{pmatrix}$, then find AB.

4. Show that $\dfrac{1-\cos 2\theta}{\sin 2\theta} = \tan\theta$

5. Prove that $\sin 10° \sin 50° \sin 70° = \dfrac{1}{8}$

6. Express the complex number $\sqrt{3} + i$ in modulus-amplitude form.

7. Find the distance between the parallel lines $x + 2y + 3 = 0$ and $x + 2y + 8 = 0$.

8. Evaluate $\lim_{x \to 3} \frac{x^3 - 27}{x - 3}$

9. Find the derivative of $\sqrt{x} + 3\tan x$ w.r.t. x.

10. If $x = at^2$ and $y = 2at$, then find $\frac{dy}{dx}$.

PART—B

8×5=40

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

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

11. *(a)* Show that $\begin{vmatrix} 1 & a & bc \\ 1 & b & ca \\ 1 & c & ab \end{vmatrix} = (a-b)(b-c)(c-a)$

(OR)

(b) Solve the system of linear equations $3x + y + 2z = 3$, $2x - 3y - z = -3$ and $x + 2y + z = 4$ using matrix inversion method.

12. *(a)* Prove that $\frac{\sin\theta + \sin 3\theta + \sin 5\theta}{\cos\theta + \cos 3\theta + \cos 5\theta} = \tan 3\theta$

(OR)

(b) Show that $\tan^{-1}\left(\frac{1}{4}\right) + \tan^{-1}\left(\frac{3}{5}\right) = \frac{\pi}{4}$

13. *(a)* Solve $2\cos^2\theta - 3\cos\theta + 1 = 0$

(OR)

(b) In any ΔABC, prove that $\cot A + \cot B + \cot C = \frac{a^2 + b^2 + c^2}{4\Delta}$.

14. *(a)* Find the equation of the circle passing through the points (0, 0), (2, 0) and (0, 3).

(OR)

(b) Find the vertex, focus; equations of axis, directrix, latus-rectum and length of the latus-rectum of the parabola $y^2 = 32x$.

15. *(a)* Find $\frac{dy}{dx}$, if $y = (\cos x)^x$.

(OR)

(b) If $u(x, y, z) = \log(x + y + z)$, then prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z} = 1$.

PART—C

10×1=10

Instructions : (1) Answer the following question.

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

16. Find the lengths of tangent, normal, sub-tangent and subnormal to the circle $x^2 + y^2 - 6x - 2y + 5 = 0$ at $(2, -1)$.

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