7028

BOARD DIPLOMA EXAMINATION, (C-20)

MAY—2023

DECE - 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. A function f is defined by $f(x) = 5 - 9x$, then find

(a) $f(-1)$

(b) $f(2)$

(c) $f(3)$

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

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

4. Prove that $\frac{\cos 11^\circ + \sin 11^\circ}{\cos 11^\circ - \sin 11^\circ} = \tan 56^\circ$

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

6. Find the additive and multiplicative inverse of the complex number $4 - 3i$.

7. Find the perpendicular distance of the point (2, 3) from the line $2x + 3y + 5 = 0$.

8. Evaluate $\lim_{x \to 2} \frac{x^7 - 2^7}{x - 2}$

9. Differentiate $3x^4 - 4\log x + \tan x$.

10. If $y = \sin(\log x)$, then find $\frac{dy}{dx}$.

PART—B

8×5=40

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

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

(3) Answers should be comprehensive and criterion for valuation is the content but not the length of the answer.

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

(OR)

(b) Solve the following equations by using Cramer's rule.
$2x - 3y + z = -1$, $x + 4y - 2z = 3$, $4x - y + 3z = 11$

12. *(a)* If $\cos x + \cos y = \frac{3}{7}$ and $\cos x - \cos y = \frac{5}{9}$, show that

$$27 \tan \frac{x-y}{2} + 35 \cot \frac{x+y}{2} = 0$$

(OR)

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

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

(OR)

(b) In any ΔABC, show that $\sum 2bc\cos A = a^2 + b^2 + c^2$.

14. *(a)* Find the equation of the circle having (4, 2) and (1, 5) as the end points of the diameter and also find its centre and radius.

(OR)

(b) Find the centre, vertices, length of axes, eccentricity, foci and equations of the latera-recta and directrices of the ellipse $9x^2 + 16y^2 = 144$.

15. *(a)* Find $\frac{dy}{dx}$, if $x^3 + y^3 - 9xy = 0$

(OR)

(b) If $u = \tan^{-1}\left(\frac{x^3 + y^3}{x - y}\right)$, prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \sin 2u$.

PART—C

10×1=10

Instructions : (1) Answer the following question.

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

(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.

16. Find the lengths of tangent, normal, sub-tangent and sub-normal of the curve $y = x^2 - 3x + 2$ at (2, 3).

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