7028

BOARD DIPLOMA EXAMINATION, (C-20)

JUNE/JULY—2022

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. If function f is defined by $f(x) = \dfrac{x+1}{x+3}$, then find the values of
(i) $f(3)$, *(ii)* $f(-1)$ and *(iii)* $f(2)$.

2. Resolve $\dfrac{1}{(x-5)(x-3)}$ into partial fractions.

3. If $A = \begin{bmatrix} 1 & -1 \\ 2 & 3 \end{bmatrix}$, then compute $A + A^T$.

4. Show that $\cos 75° = 2 - \sqrt{3}$

5. Show that $\dfrac{\cos 7A}{\sec A} - \dfrac{\sin 7A}{\operatorname{cosec} A} = \cos 8A$

6. Find the conjugate and modulus of $z = 2 - 3i$

7. Find the equation of the straight line passing through the points $(2, 3)$ and $(5, 6)$.

8. Evaluate $\lim\limits_{\theta \to 0} \dfrac{\sin 12\theta}{\sin 8\theta}$

9. If $y = \log x + e^x - \sin x$, then find $\dfrac{dy}{dx}$.

10. If $u = x^3 - 3x^2 y - y^3$, then find $\dfrac{\partial u}{\partial x}$ and $\dfrac{\partial u}{\partial y}$.

PART—B

8×5=40

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

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

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 system of linear equations by using Cramer's Rule :

$$2x - y + 3z = 9,\ x + y + z = 6,\ x - y + z = 2$$

12. *(a)* Show that $\dfrac{\cos 3A - \cos A}{\sin A - \sin 3A} = \tan 2A$

(OR)

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

13. *(a)* Solve $\sin 5\theta - \sin 3\theta + \sin \theta = 0$

<div align="center">(OR)</div>

(b) In a ΔABC, show that $b\cos^2\left(\dfrac{c}{2}\right) + c\cos^2\left(\dfrac{B}{2}\right) = s$

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

<div align="center">(OR)</div>

(b) Find the centre, vertices, length of axes, length of latus rectum, ecentricity foci and equations of the laterea recta and directrices of the ellipse $25x^2 + 9y^2 = 225$.

15. *(a)* If $y = \sqrt{x + \sqrt{x + \sqrt{x + \cdots .. \infty}}}$ times, then find $\dfrac{dy}{dx}$.

<div align="center">(OR)</div>

(b) If $x = a\cos^3\theta$ and $b\sin^3\theta$, then find $\dfrac{dy}{dx}$ at $\theta = \dfrac{\pi}{4}$.

<div align="center">

PART—C   10×1=10

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Instructions :   (1) Answer the following question.

               (2) It carries **ten** marks.

16. A circular metal plate expands by heat so that its radius increases at the rate of 0·01 cm/sec. At what rate is the surface increasing when the radius is 2 cm?

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