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 $\cos 75^\circ = 2 - \sqrt{3}$

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

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 $\tan^{-1}\dfrac{1}{4} + \tan^{-1}\dfrac{3}{5} = \dfrac{\pi}{4}$

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

(OR)

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

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

(OR)

(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 $\dfrac{dy}{dx}$.

(OR)

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

PART—C

10×1=10

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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