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 CHPP-PET-AMT-AMG-WD-CAI-AIM-CCB-CCN-
 COMMON -102

7002

BOARD DIPLOMA EXAMINATION, (C-20)

JANUARY—2023

FIRST YEAR (COMMON) EXAMINATION

ENGINEERING MATHEMETICS-I

Time : 3 hours]

[Total Marks : 80

PART—A

3×10=30

- Instructions : (1) Answer all questions.
 (2) Each question carries three marks.
 (3) Answers should be brief and straight to the point and shall not exceed five simple sentences.

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 $A = \begin{bmatrix} 1 & 2 & 3 \\ 3 & 2 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 2 & 1 \\ 1 & 2 & 3 \end{bmatrix}$, then find $3B - 2A$.

4. If $\tan \alpha = \frac{1}{2}$ and $\tan \beta = \frac{1}{3}$, and $0 < \alpha, \beta < \frac{\pi}{2}$, then show that $\alpha + \beta = \frac{\pi}{4}$.

5. Prove that $\frac{1 + \cos 2\alpha}{\sin 2\alpha} = \tan \alpha$.

6. Find the modulus of the complex number $(3+4i)(2-3i)$.

7. Find the perpendicular distance of the point (3,2) from the straight line $4x - 5y - 6 = 0$.

8. Evaluate $\lim_{x \rightarrow 5} \frac{x^4 - 625}{x - 5}$.

9. Find the derivative of $3 \tan x - 4(\log_e x) - 7x^2$ w.r.t. x .

10. If $x = a \cos \theta$ and $y = b \sin \theta$, then find $\frac{dy}{dx}$.

PART—B

8×5=40

Instructions : (1) Answer all questions.

(2) Each question carries eight marks.

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

(OR)

(b) Solve the following system of linear equations using Cramer's rule :

$$2x - y - 3z = 9, x - y - z = 6 \text{ and } x + y - z = 2$$

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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) If $\sin^2 x + \sin^2 y + \sin^2 z = \frac{3}{2}$, then show that

$$x^2 + y^2 + z^2 - 2xyz = 1.$$

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13. (a) Solve $2\sin^2 \theta - 4\cos \theta$

(OR)

(b) In any ΔABC , show that $a^3 \cos(B - C) = 3abc$.

14. (a) Find the equation of the circle with (1,2) and (-2,3) as the two ends of its diameter and also find its center and radius.

(OR)

(b) Find the vertex, focus, equations of axis, latus-rectum, directrix and length of latus-rectum of the parabola $y^2 = -12x$.

15. (a) Find the derivative of $\tan^{-1} \frac{2x}{1-x^2}$ w.r.t $\sin^{-1} \frac{2x}{1-x^2}$.

(OR)

(b) If $y = (2-3x)(x-4) \frac{x^2-1}{x^2+1}$, find $\frac{dy}{dx}$.

PART—C

10×1=10

Instructions : (1) Answer the following question.

(2) The question carries ten marks.

* 16. A wire of length 50 cm is cut into two parts which are bent in the form of a square and a circle. Find the minimum value of sum of the areas so formed.



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