



C20-EE-CHPP-102

7035

BOARD DIPLOMA EXAMINATION, (C-20)

SEPTEMBER/OCTOBER—2021

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 $f : \mathbb{R} \rightarrow \mathbb{R}$ is defined by $f(x) = 3x - 5$, then prove that $f(x)$ is onto function.

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

3. If $A = \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & 4 \\ -1 & 2 \end{bmatrix}$, then find AB and BA and also show that $AB \neq BA$.

4. Prove that $\frac{\cos 12^\circ + \sin 12^\circ}{\cos 12^\circ - \sin 12^\circ} = \tan 57^\circ$

5. Prove that $\frac{1 - \cos 2\theta}{\sin 2\theta} = \tan \theta$

6. Find the additive and multiplicative inverses of the complex number $4 - 5i$
7. Find the acute angle between the lines $2x + y + 4 = 0$ and $y - 3x = 7$
8. Evaluate $\lim_{x \rightarrow 0} \frac{\tan 7x}{x}$
9. Find the derivative of $(2\sqrt{x} + 3 \operatorname{cosec} x + 4 \tan x)$ w.r.t. 'x'
10. Find $\frac{dy}{dx}$, if $y = t^2$, $x = 2t$

PART—B

8×5=40

- Instructions :** (1) Answer **all** questions.
 (2) Each question carries **eight** marks.

11. (a) Find the inverse of the matrix $\begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$

OR

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

$$x + 2y + 3z = 6, 3x - 2y + 4z = 5 \text{ and } x - y - z = -1$$

12. (a) Prove that $\sin^2 A + \sin^2(60^\circ + A) + \sin^2(60^\circ - A) = \frac{3}{2}$

OR

- (b) Prove that $\tan^{-1}\left(\frac{3}{4}\right) + \tan^{-1}\left(\frac{3}{5}\right) - \tan^{-1}\left(\frac{8}{19}\right) = \frac{\pi}{4}$

13. (a) Solve the equation $\sin 6\theta \cos 2\theta - \sin 5\theta \cos \theta = 0$

OR

(b) In a ΔABC , show that
$$\frac{\cot \frac{A}{2} + \cot \frac{B}{2} + \cot \frac{C}{2}}{\cot A + \cot B + \cot C} = \frac{(a+b+c)^2}{a^2 + b^2 + c^2}$$

14. (a) Find the equation of the circle passing through the points (1, 1), (2, -1) and (3, 2)

OR

- (b) Find the equation of the rectangular hyperbola whose focus is the point (-1, -3) and directrix is the line $2x + y + 1 = 0$

15. (a) Find the derivative of $x^3 \log x + \frac{1-x}{1+x} + e^{\sin x}$ w.r.t. 'x'

OR

- (b) Find all first and second order partial derivatives of $u = x^3 - 8xy + y^3$

and verify that
$$\frac{\partial^2 u}{\partial x \partial y} = \frac{\partial^2 u}{\partial y \partial x}$$

PART—C

10×1=10

Instructions : (1) Answer the following question.

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

16. One end of a ladder 17 ft. long is leaning against a vertical wall. If the foot of the ladder is pulled away from the wall at the rate of 3 ft/min., how fast is the top of the ladder descending when the foot of the ladder is 8 ft. from the wall?

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