7035

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 $f : \mathbb{R} \to \mathbb{R}$ 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 $\lim_{x \to 0} \frac{\tan 7x}{x}$

**9.** Find the derivative of $\left(2\sqrt{x} + 3\operatorname{cosec} x + 4\tan x\right)$ 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 :

$x + 2y + 3z = 6$, $3x - 2y + 4z = 5$ and $x - y - z = -1$

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

**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 $\Delta ABC$, show that $\dfrac{\cot\frac{A}{2} + \cot\frac{B}{2} + \cot\frac{C}{2}}{\cot A + \cot B + \cot C} = \dfrac{(a+b+c)^2}{a^2+b^2+c^2}$

**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 $x^3 \log x + \dfrac{1-x}{1+x} + e^{\sin x}$ w.r.t. '$x$'

**OR**

*(b)* Find all first and second order partial derivatives of $u = x^3 - 8xy + y^3$ and verify that $\dfrac{\partial^2 u}{\partial x \partial y} = \dfrac{\partial^2 u}{\partial y \partial x}$

## 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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