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C20-EE-CHPP–102

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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 $f:\square\to\square$ 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 $\frac{1-\cos 2\theta}{\sin 2\theta}=\tan\theta$

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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 ΔABC, 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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