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C20-EC-CHPC-PET–**102**

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BOARD DIPLOMA EXAMINATION, (C-20)

SEPTEMBER/OCTOBER—2021

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 the function f is defined by $f(x)=\frac{2x+3}{5}$, then find the values of *(i)* $f(-2)$, *(ii)* $f(0)$ and *(iii)* $f(3)$.

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

3. If $A=\begin{bmatrix} 2 & 3 & 1 \\ 0 & -1 & 5 \end{bmatrix}$ and $B=\begin{bmatrix} 1 & 2 & -6 \\ 0 & -1 & 3 \end{bmatrix}$, then find $2A-3B$.

4. Prove that $\tan(45+A)\cdot\tan(45-A)=1$

5. Prove that $\cos 10^\circ \cos 50^\circ \cos 70^\circ=\frac{\sqrt{3}}{8}$

6. Find the modulus of the complex number $\left(\frac{3-4i}{5+7i}\right)$.

7. Find the distance between the two parallel lines $3x - 4y + 7 = 0$ and $3x - 4y + 5 = 0$.

8. Find $\lim_{x\to 2} \frac{x^4 - 16}{x-2}$.

9. Differentiate $x.\sec x$ with respect to x.

10. Differentiate $\log(1 + \tan^{-1}x)$.

PART—B

8×5=40

Instructions : (1) Answer **all** questions.

(2) Each question carries **eight** marks.

11. *(a)* If $A = \begin{bmatrix} 2 & 7 & 13 \\ 3 & 9 & 4 \\ 1 & 5 & 3 \end{bmatrix}$, find the adjoint and inverse of the matrix.

OR

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

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

12. *(a)* If $\sin x + \sin y = \frac{3}{4}$ and $\sin x - \sin y = \frac{2}{5}$, then prove that

$$8\cot\frac{x-y}{2} = 15\cot\frac{x+y}{2}$$

OR

(b) Show that $\sin^{-1}\frac{3}{5} + \sin^{-1}\frac{8}{17} = \cos^{-1}\frac{36}{85}$

13. *(a)* Solve $\sin 6\theta \cos 2\theta = \sin 5\theta \cos\theta$

OR

(b) In a ΔABC, if $A = 60°$, then prove that $\frac{c}{a+b} + \frac{b}{c+a} = 1$.

14. *(a)* Find the centre and radius of the circle

$$3x^2 + 3y^2 - 12x + 6y + 11 = 0$$

OR

(b) Find the equation of the rectangular hyperbola whose focus is the point (1, 2) and directrix is the line $3x + 4y - 5 = 0$.

15. *(a)* Find the derivative of $\tan^{-1}\left(\frac{2x}{1-x^2}\right)$ with respect to $\sin^{-1}\left(\frac{2x}{1+x^2}\right)$.

OR

(b) If $y = \sin(\log x)$, then show that $x^2 y_2 + xy_1 + y = 0$.

PART—C

10×1=10

Instructions : (1) Answer the following question.

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

16. Find the lengths of tangent, normal, sub tangent and subnormal to the curve $y = x^3 - 2x^2 + 4$ at the point (2, 4).

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