1701E1174

Candidate's Seat No :_____

IMSc CS (NEP) Sem.-1 Examination

Mathematical Foundation

January-2025

Time : 2-00 Hours] **Total Marks:25**

Q.1 **[10]**

(A) Three newspaper A, B, C are published from a city. The survey of 200 people in the city provided the following information. (1) 88 people read A. (2) 82 people read B. (3) 68 people read C. (4) 28 people read both A and B. (5) 46 people read both B and C. (6) 23 people read both C and A. (7) 8 people read all the three papers. Answer the following:

a. Out of 200 people, how many are reading at least one paper?

b. How many people read none of these papers?

(B) Use the truth table method to verify whether the following logical equivalences are correct or not: $(p \wedge q) \vee r) \equiv (p \rightarrow \neg q) \rightarrow r$

OR

(A) Consider $U = \{-3,-1,0,1,3\}$, $A = \{-3,-1,1\}$, $B = \{-1,1,3\}$ and $C = \{-1,0,1\}$. Then compute the following:

a. $A \times B$ b. $A \times (B \cap C)$

c. $A \Delta B$ d. $A - B$

(B) Find the coordinates of the point which divides, internally and externally, the line joining $(-1,2)$ to $(4,-5)$ in the ratio 2:3

Q.2 **[10]**

(A) Examine the continuity of the function at mentioned point:

$$f(x) = \begin{cases} 3 + 2x, & if\ x \geq 0 \\ 3 - 2x, & if\ x < 0 \end{cases} \quad \text{at } x = 0$$

(B) Find the derivative of function using chain rule with respect to variable x:

$$f(x) = \left(\frac{x^2}{8} + x - \frac{1}{x}\right)^4$$

OR

(A) Using definition of differentiation, calculate the derivative

$$f(x) = \frac{1-x}{2x}$$

Also find the values of the derivatives of $f'(1)$ and $f'(\sqrt{2})$.

(B) Evaluate using integration by parts: $\int x^2 e^x\, dx$

Q.3 **Attempt any FIVE out of SEVEN:** **[5]**

1. Define: Even Function
2. State whether the following statement is true or false: $3 \in \{1, \{2,3\}, 4\}$
3. Write down range of the function $f(x) = 1 - \sqrt{x}$.
4. **Formalize the following sentences:** Every student who takes Analysis also takes Geometry.
5. Find the mid-point of the line segment joining two points (-3, 5) and (9,3).
6. $\frac{d}{dx}(-10x + 3cosx) =$ _____.
7. Evaluate: $\int_1^{10} \frac{1}{x^2} dx$