

Total No. of Questions : 4]

SEAT No. :

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**S.E. (Computer Engineering/Computer Science & Design
Engg/Artificial Intelligence & Data Science Engg.) (Insem)**

DISCRETE MATHEMATICS

(2019 Pattern) (Semester - III) (210241)

Time : 1 Hour]

[Max. Marks : 30

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume Suitable data, if necessary.*

Q1) a) Let $A = \{1, 2, 3\}$ and $B = \{1, 2, 3, 4, 5\}$. Find **[5]**

- i) $P(A \cup B)$
- ii) $P(A \cap B)$
- iii) $A - B$

b) By using mathematical induction prove that

$$S_n = 1 + 3 + \dots + (2n - 1) = n^2; \text{ for all integers } n \geq 1 \quad \text{[5]}$$

c) Let P : I will study hard and Q : I will get admission in IIT.

Statement: If I study hard then I will get admission in IIT.

Write the Converse, Inverse & Contrapositive of the above statement. **[5]**

OR

Q2) a) Suppose 100 Computer Engineering students studies at least one of the following language C, C++ and Python. It is given that 65 students studies C language, 45 studies C++ language and 42 studies Python language. 20 students studies C and C++ language, 25 student studies C and Python language, 15 students studies C++ and Python language. Find students studying : **[5]**

- i) Only C and C++ language, not Python language
- ii) Only C and Python language, not C++ language

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- b) Use mathematical induction to prove $S_n = 2 + 4 + 6 + 8 + \dots + 2n = n(n+1)$ for all positive integer n . [5]
- c) What is Logical Equivalence? Show that $\sim(q \rightarrow p) \vee (p \wedge q) \equiv q$ [5]

- Q3)** a) Let $A = \{0, 2, 4, 6, 8, 10\}$ and Relation aRb defined on set A as $aRb = \{(a,b) \mid (a-b) \% 2 == 0; \forall a,b \in A\}$.
Find aRb is Equivalence Relation or not? [5]
- b) Write the relation pairs and Draw the Hasse Diagram for the Relation defined on set 'X' as $aRb = \{(a, b) \mid a \text{ divides } b; \forall a,b \in X\}$;
where $X = \{10, 20, 30, 40, 50, 60, 80, 100\}$. [5]
- c) If $f(x) = 2x + 5$ and $g(x) = 5x + 2$ find [5]
- $f \circ g(5)$
 - $f \circ g(2) + g \circ f(2)$

OR

- Q4)** a) If $X = \{10,20,30,40,50\}$ & Relation on set 'X' is represented as $aRb = \{(a, b) \mid a \text{ divides } b; \forall a,b \in X\}$. Find a relation aRb is Partial Order Relation or not? [5]
- b) Let $A = \{1, 2, 4, 8, 16, 24, 32, 48\}$. A relation on set 'A' is defined as $aRb = \{(a, b) \mid a \text{ divides } b; \forall a,b \in A\}$. [5]
- Write Relation aRb
 - Write any two Chain of aRb on set 'A'
 - Write any two Anti Chain of aRb on set 'A'
- c) If $f(x) = 16x^2 + 12$. Find Inverse of $f(x)$. Is the inverse of $f(x)$ is function? Justify. [5]

