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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

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

**P.T.O.**

- 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]
- $\text{fog}(5)$
  - $\text{fog}(2) + \text{gof}(2)$

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]

