

Total No. of Questions : 4]

SEAT No. :

PE-546

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[6578]-19

**S.E. (Computer/A.I.&D.S./Computer Science & Design/
Computer Science) (Insem.)
DISCRETE MATHEMATICS
(2019 Pattern) (Semester - III) (210241)**

Time : 1 Hour]

[Max. Marks : 30

Instructions to the candidates:

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4.*
- 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) Solve following : **[5]**

- i) Find the cardinality of the Power Set of A, where $A = \{1,2,9\}$
 - ii) If $A = \{1,2\}$, $B = \{2,3,4\}$, $C = \{4,5\}$, then find: $A \times (B \cap C)$
 - iii) Let $A = \{1, 2, 3\}$ and $B = \{1, 2, 3, 4, 5\}$. Find : $P(A \cup B)$, $P(A \cap B)$,
 $A - B$
- b) By using Mathematical Induction, prove that : **[5]**
 $1+2+3+\dots+n = n(n+1)/2$ for all natural number values of n.
- c) Let p and q be the propositions **[5]**
p : It is below freezing.
q : It is snowing.

Write these propositions using p and q and logical connectives

- i) It is below freezing and snowing.
- ii) It is below freezing but not snowing.
- iii) It is either snowing or below freezing (or both).
- iv) If it is below freezing, it is also snowing.
- v) Either it is below freezing or it is snowing, but it is not snowing if it is below freezing.

OR

Q2) a) A large software development company employs 100 computer programmers. Of them, 45 are proficient in Java, 30 in C#, 20 in Python, six in C# and Java, one in Java and Python, five in C# and Python and just one programmer is proficient in all three languages above.

Determine the number of computer programmers that are not proficient in any of these three languages. **[5]**

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) Explain following terms with example. [5]
- Symmetric difference between set
 - Universal Set
 - Compliment of a Set
 - Power Set
 - Proper sub-set

Q3) a) What is equivalence Relation?

Let $A = \{1,2,3,4,5\}$ and let

$R = \{(1,1), (1,2), (2,1), (1,3), (1,4), (4,5), (5,1), (1,5), (4,1)\}$.

Draw digraph of R .

[5]

b) Let R be a relation on Set $A = \{1,2,3,4\}$, given as $R = \{(1, 1), (1, 4), (2, 2), (2, 3), (3, 2), (3, 3), (4, 1), (4, 4)\}$ Find transitive closure using Warshalls Algorithm. [5]

c) i) If $f(x) = x^2 - 1$, $g(x) = x - 2$ find a , if $\text{gof}(a) = 1$.

ii) Find k , if $f(k) = 2k - 1$ and $\text{fof}(k) = 5$.

[5]

OR

Q4) a) Construct the Hasse diagram for the "a divides b" relation, on the set $\{2, 3, 4, 6, 8, 9, 12, 18\}$. [5]

b)

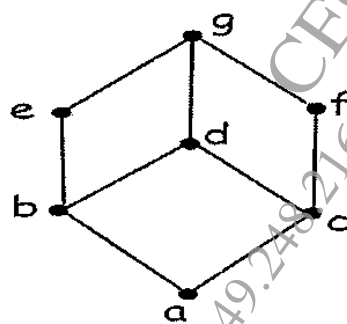


Fig (a)

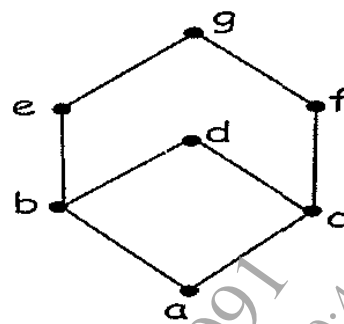


Fig (b)

Find whether above posets are Lattices or not?

c) Using the function f and g , check whether $\text{fog} = \text{gof}$,

$f(x) = 4x^2 - 1$, $g(x) = 1+x$

[5]

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