M.SC. - I (Computer Science) (CBCS Pattern) First Semester

PSCSCT02 - Discrete Mathematics Paper-II

P. Pages : 2 **GUG/W/18/11143**

Time : Three Hours Max. Marks : 80

Notes : 1. All questions are compulsory and carry equal marks.
2. Draw neat and labelled diagram and use supporting data wherever necessary.
3. Avoid vague answer and write specific answer related to question.

1. Either.

a) Prove the following by mathematical induction. **8**

$$1+2+3+4+--+n=\frac{n(n+1)}{2}.$$

b) Show that the following are equivalent formulas. **8**

i) $P \vee (P \wedge Q) \Leftrightarrow P$

ii) $P \vee (\neg P \wedge Q) \Leftrightarrow P \vee Q.$

OR

c) If $\begin{bmatrix} a+b & c+d \\ c-d & a-b \end{bmatrix} = \begin{bmatrix} 4 & 6 \\ 10 & 2 \end{bmatrix}$ find a, b, c and d. **8**

d) Obtain the principle conjunctive normal form of the given formula. **8**

$(\neg P \to R) \wedge (Q \rightleftarrows p).$

2. Either.

a) Consider a finite set $A = \{5, 6, 7\}$ Let **8**

$$P_1 = \begin{pmatrix} 5 & 6 & 7 \\ 5 & 7 & 6 \end{pmatrix} \text{ and } P_2 = \begin{pmatrix} 5 & 6 & 7 \\ 6 & 5 & 7 \end{pmatrix}$$

be two permutations of A.

Determine $P_1 \cdot P_2$ and $P_2 \cdot P_1$.

b) What is Relation? Explain properties of Relation with suitable example. **8**

OR

c) Demonstrate Pigeonhole principle with suitable example. **8**

d) Let A = {1, 2, 3} and B = {1, 2, 3, 4} and R^1 and S^1 be the relations from A and B whose matrices are as **8**

$$M_R = \begin{bmatrix} 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 1 & 1 & 1 & 0 \end{bmatrix}, M_S = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 1 \end{bmatrix}$$

find $\bar{S}$, $R \cap S$, $R \cup S$ and R^{-1}

munotes.in

3. Either.

a) Prove that in a distribute lattice the complement of a element is unique. **8**

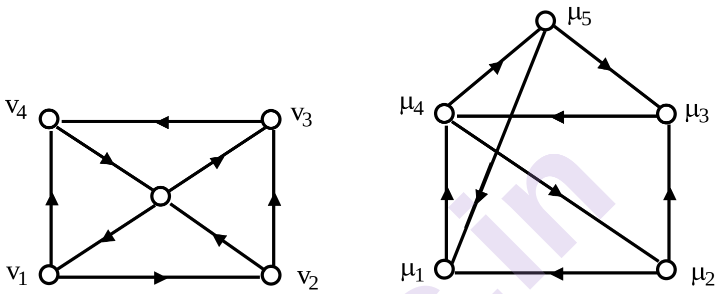
b) Prove that if $f: X \to Y$ and $g: Y \to Z$ be two one-to-one function, then $g \circ f$ is also one-to-one onto function. **8**

OR

c) Define the following with suitable diagram. **8**

i) Mixed graph. ii) Multigraph.
iii) Null graph iv) Undirected graph.

d) Show that the following graphs are Isomorphic. **8**



4. Either.

a) What is Moore machine? Explain. **8**

b) Show that $\left(a^{-1}\right)^{-1} = a$, for all $a \in G$, where G is group and a^{-1} is an inverse of a. **8**

OR

c) Let G be the grammar as **8**

$S \to aB \mid bA$

$A \to a \mid aS \mid bAA$

$B \to b \mid bS \mid aBB$

for the string 'aaabbabbba' find

i) Leftmost Derivation ii) Rightmost derivation.

d) Let T be the set of all even integer. Show that the semigroup $(Z,+)$ and $(T,+)$ are isomorphic. **8**

5. Solve all the questions.

a) Define the following with an example. **4**
   i) Intersection of two sets.
   ii) Symmetric difference of two sets.

b) Define equivalence Relation. Explain with suitable example. **4**

c) Explain. **4**
   i) Hamiltonian path. ii) Euler Path.

d) Define finite state machine. **4**

****

munotes.in