

M.Sc. - I (Computer Science) (CBCS Pattern) Semester-I
PSCSCT02 - Paper-II - Discrete Mathematics

P. Pages : 3

Time : Three Hours



GUG/W/24/11143

Max. Marks : 80

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

Either:

1. a) If A and B are matrices then. 8
- i) $(A^T)^T = A$ ii) $(A+B)^T = A^T + B^T$
- b) Show that 8
- i) $\sim(P \vee Q) \equiv \sim p \wedge \sim q$ ii) $\sim(P \wedge Q) \equiv \sim p \vee \sim q$

OR

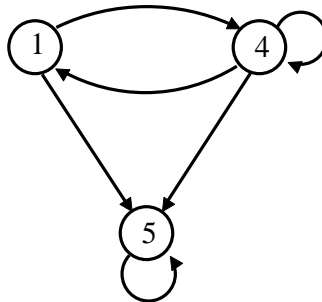
- c) Prove $1^2 + 2^2 + 3^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}$ 8
- Prove by mathematical induction.
- d) Show that 8
- $(P \vee Q) \wedge (\neg P \wedge (\neg Q \wedge \neg R)) \vee$
 $(\neg P \wedge \neg Q) \vee (\neg P \wedge \neg R)$ is a tautology.

Either:

2. a) Determine the value of n if 8
- i) $6x^n p_3 = 3x^{n+1} p_3$ ii) $3x^n p_4 = 7x^{n-1} p_4$
- b) Solve the recurrence relation $a_n = 4a_{n-1} + 5a_{n-2}$ with initial condition $a_1 = 2$ and $a_2 = 6$. 8

OR

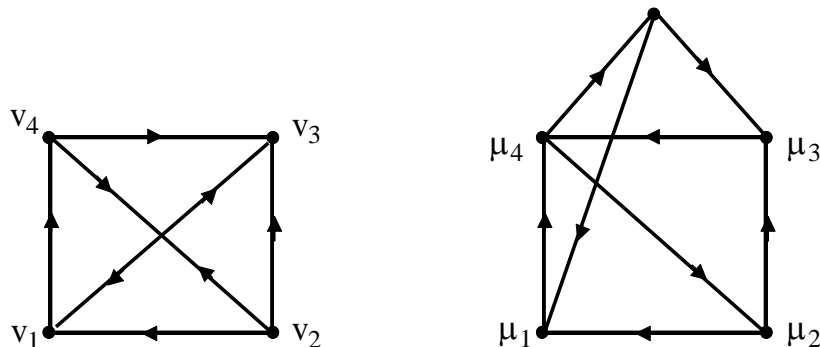
- c) Let $A = \{1, 4, 5\}$ and Let R be given by the diagram shown in fig. find M_R & R 8



- d) Let $A = \{4, 6, 8, 10\}$ and $R = \{(4, 4), (4, 10), (6, 6), (6, 8), (8, 10)\}$ is a relation on set A . Determine the transitive closure of R using Warshall's algorithm. 8

Either:

3. a) Show that following diagram are isomorphic. 8



- b) Define 8

- | | |
|------------------|--------------------------|
| i) Tree | ii) Height of tree |
| iii) Binary tree | iv) Complete binary tree |

OR

- c) Show that De'morgan's law given by 8
 $(a * b)' = a' \oplus b'$ and
 $(a \oplus b)' = a' * b'$
- d) Prove that $a \cdot (b + c) = a \cdot b + a \cdot c$. 8

Either:

4. a) If N is a normal subgroup of G if and only if $gN = Ng$. 8
- b) Show that $(ab^{-1})^{-1} = b^{-1}a^{-1}$ for all $a, b \in G$. 8

OR

- c) Let G be the grammar 8
 $S \rightarrow aB \mid bA$
 $A \rightarrow a \mid aS \mid bAA$
 $B \rightarrow b \mid bS \mid aBB$
For the string 'aaabbabbba' in find
i) Leftmost derivation
ii) Rightmost derivation
iii) Parse tree

d) Draw the diagram of finite state machine where state transition table is

8

	a	b	c
S_0	S_0	S_1	S_2
S_1	S_2	S_1	S_1
S_2	S_1	S_1	S_2
S_3	S_2	S_0	S_1

5. Attempt all the questions.

a) If $\begin{bmatrix} a+b & c+d \\ c-d & a-b \end{bmatrix} = \begin{bmatrix} 4 & 6 \\ 10 & 2 \end{bmatrix}$

4

Find a, b, c and d

b) Define

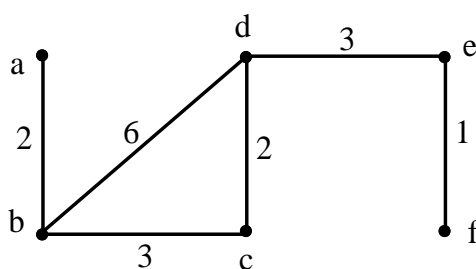
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i) Injective (one to one) function

ii) Surjective (onto) function.

c) Find all the spanning trees of graph G.

4



d) Let $G = (V, S, V_0 \mapsto)$

4

$$V = \{V_0, a\}$$

$$S = \{a\}$$

$$\mapsto : V \mapsto aaV.$$

$$V \mapsto aa$$

Find $L(G)$
