M.Sc. (Computer Science)-I First Semester Old

1MSC1 - Discrete Mathematical Structure Paper-I

P. Pages : 3 **GUG/W/18/2878**

Time : Three Hours * 3 8 8 0 * Max. Marks : 80

Notes : 1. All the questions are compulsory & carry equal marks.
2. Draw Neat & Labelled diagrams wherever necessary.
3. Avoid vague answers and write answers relevant and specific to questions only.

1. Either

a) To Show **8**

1) $A \cap A = A$ 2) $A \cap \phi = \phi$

3) $A \cap (B \cap C) = (A \cap B) \cap C$ 4) $A \cup B = B \cup A$

b) Let A and B be square matrices, if AB = BA then $(AB)^n = A^n B^n$ for $n \geq 1$. **8**

OR

c) Construct the truth table for the following formula. **8**

i) $(\neg P \wedge (\neg Q \wedge R)) \vee (Q \wedge R) \vee (P \wedge R)$

ii) $\neg(P \vee (Q \wedge R)) \rightleftarrows ((P \vee Q) \wedge (P \vee R))$

d) Show that $R \rightarrow S$ can be derived from the premises $P \rightarrow (Q \rightarrow S)$, $\neg R \vee P$ and Q. **8**

2. Either

a) Determine the value of n if **8**

1) $4 \times {}^{n}P_3 = {}^{n+1}P_3$ 2) $6 \times {}^{n}P_3 = 3 \times {}^{n+1}P_3$ 3) $3 \times {}^{n}P_4 = 7 \times {}^{n-1}P_4$

b) Let $x = \{1, 2, 3, 4\}$ and R = {(1, 1), (4, 1), (1, 4), (4, 4), (2, 2) (2, 3) (3, 2) (3, 3)}. Write Matrix of R and also its diagraph. **8**

OR

c) Let A = {a, b, c, d}, Let R = {(a, b), (a, c), (b, a), (b, c), (c, d), (d, a)} Find the transitive closure of R. **8**

d) Let x = {1, 2, 3}, y = {a, b} and z = {5, 6, 7}. Consider the function f = {1, a) (2, a) (3, b)} and g = {a, 5), (b, 7) as in a fig. (a) and (b). Find the composition of $g \circ f$. **8**

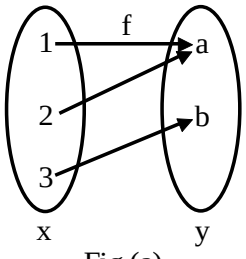

Fig.(a)

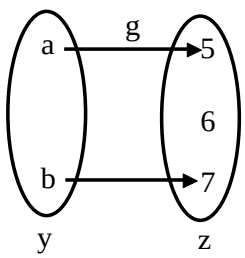

Fig.(b)

3. Either

a) Show that following graph are isomorphic. **8**

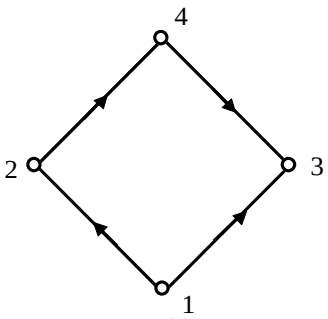

Fig. (a)

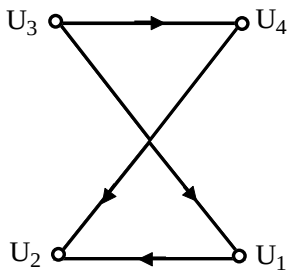

Fig. (b)

b) Show that the graph of fig. (b) does not contain a Hamiltonian cycle. **8**

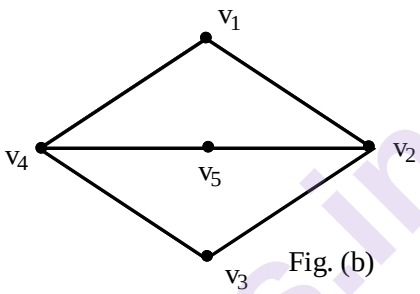

Fig. (b)

A graph with no Hamiltonian cycle

OR

c) What do mean by Binary Expression Trees? Construct the tree. **8**

1) $(7+(6-2))-(x-(y-4))$

2) $(((2\times 7)+x)\div y)\div(3-11)$

d) Find all the spanning trees of graph G and find which is the minimal spanning tree of G show in fig. (a) **8**

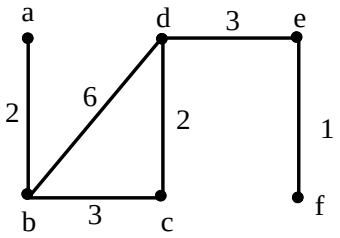

Fig. (a)

4. Either

a) Consider the binary operation * on Q, the set of rational number define by $a*b=a+b-ab \forall a,\ b\in Q$. Determine whether * is associative. **8**

b) Let $(A, *)$ be semigroup, show that for a, b, c in A, if $a*c=c*a$ and $b*c=c*b$, then $(a*b)*c=c*(a*b)$. **8**

OR

c) Consider the state transition table given as below: **8**

	a	b
S_0	S_0	S_1
S_1	S_2	S_0
S_2	S_1	S_2

1) Draw the diagraph of the machine where state transition table is given above and also find finite state machine.
2) Find the state transition function.

d) Let $G = (v, s, v_0, \mapsto)$ **8**

$v = (v_0, a, b)$

$s = (a, b)$

$\mapsto$: $v_0 \mapsto aav_0$

$v_0 \mapsto a$

$v_0 \mapsto b$

Find L(G)

5. Solve all question.

a) Write a short note on SETS and SUBSETS with example. **4**

b) Determine the value of following **4**

1) ${}^{50}C_{45}$ 2) ${}^{20}C_{10}$

c) Define the following term's **4**

1) Graph 2) Adjacent node
3) Diagraph 4) Mixed graph

d) Define Derivation Trees & Finite state Machines. **4**

****