Master of Computer Application (MCA - I) (CBCS Pattern) First Semester

PSMCAT104.1 - Paper-IV Elective-I : Discrete Mathematical Structure

P. Pages : 3 **GUG/W/18/11090**

Time : Three Hours * 3 2 0 2 * Max. Marks : 80

Notes : 1. All question are compulsory and carry equal marks.
2. Draw well labelled diagram whether necessary.
3. Avoid vague answers.

1. Either

a) Suppose A, B, C are matrices then prove that - **8**

i) $A(B + C) = AB + AC$

ii) $(AB)\,C = A(BC)$

b) Show that $P \wedge (P \vee Q)$ is a valid conclusion from the premises **8**
$P \vee Q$, $Q \rightarrow R$, $P \rightarrow M$ and $\neg M$

OR

c) Prove by mathematical induction that if $A_1, A_2, A_3 \ldots A_n$ are any n sets then - **8**

i) $\left(\bigcup_{i=1}^{\bar{n}} A_i\right) = \bigcap_{i=1}^{n} \overline{A_i}$

ii) $\bigcap_{i=1}^{n} A_i = \bigcup_{i=1}^{n} \overline{A_i}$

d) If $\begin{bmatrix} a+2b & 2a-b \\ 2c+d & c-2d \end{bmatrix} = \begin{bmatrix} 4 & -2 \\ 4 & -3 \end{bmatrix}$ Find a, b, c, d. **8**

2. Either

a) How many distinguishable permutation of the letter in the word : **8**

i) BANANA ii) HIPPOPOTAMOUS

iii) REQUIREMENTS iv) APPLE

b) Determine the value of 'n' if - **8**

i) $6 \times {}^{n}p_3 = 3 \times {}^{n+1}p_3$

ii) $3 \times {}^{n}p_4 = 7 \times {}^{n-1}p_3$

OR

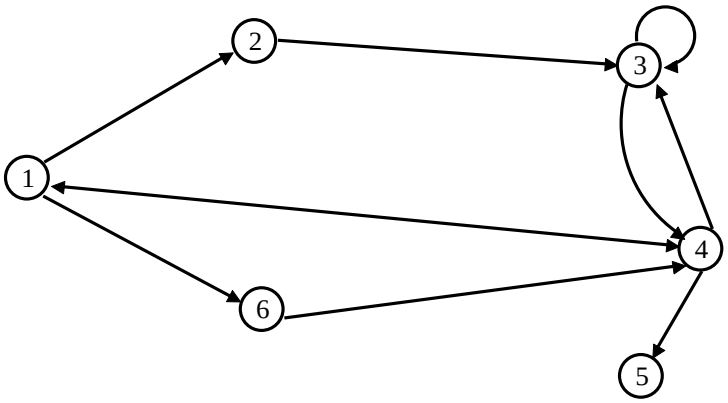
c) Prove that - **8**

i) ${}^{n}C_r = \frac{n}{r} \times {}^{n-1}C_{r-1}$

ii) $n \times {}^{n-1}C_{r-1} = {}^{(n-r+1)n}C_{r-1}$

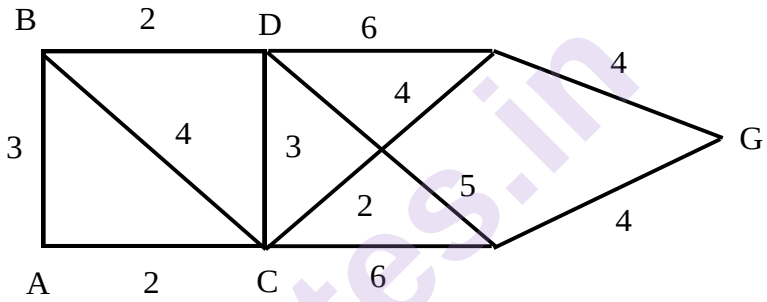
d) Let R be the relation whose diagrapht is given below. **8**

i) Find a cycle starting at vertex 6 ii) and MR^2

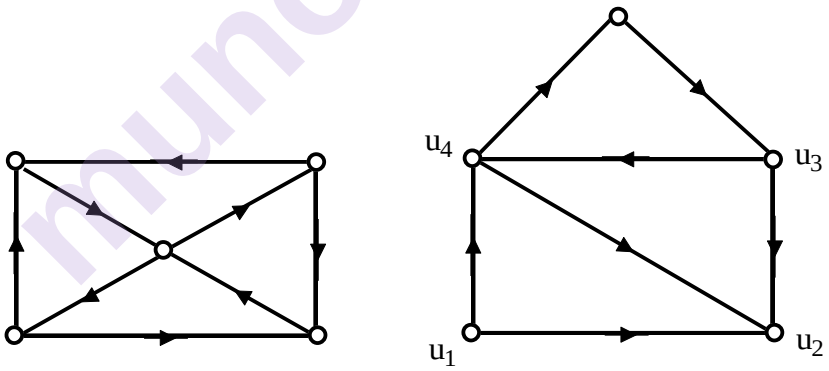


3. Either

a) Find Hamilton circuit for the given graph **8**



b) Show the diagraphs are Isomorphic. **8**



OR

c) Construct tree **8**

i) $(3 * (1-x)) \div ((4+(y+2))) * (7+(z \div y))$

ii) $((2+x)-(2*x))-(x-2)$

d) In Lattice prove that $(a*b) \oplus (a*c) \leq a*[b \oplus (a*c)]$ **8**

4. Either

a) Let G be a group and let a and b be the element of G then - **8**

i) The equation ax = b has a unique solution in G.

ii) The equation ay = b has a unique solution in G.

b) i) Construct the tree for - **8**

$(3*(1-x)) \div ((4+(7-(y+2))) * (7+(z \div y)))$

ii) $3-(x+(6*(4 \div (2-3))))$

OR

c) Consider an Algebraic system $(Q, *)$, where Q is the set of rational no and $*$ is a binary operation defined by $a*b = a+b-ab \ \forall \ a, b \in Q$. Determine whether $(Q, *)$ is a group. **8**

d) Define derivation Tree with all it's tuples and give an example of - **8**

i) Left most derivation

ii) Right most derivation

iii) Parse tree

5. Attempt all question :

a) Obtain the principle disjunctive normal form of $\neg P \vee Q$. **4**

b) Determine the value **4**

i) ${}^{9}P_{3}$ ii) ${}^{50}C_{45}$

iii) ${}^{54}P_{4}$ iv) ${}^{48}C_{6}$

c) Construct tree **4**

$(4+(y \div (6-2))) \times 7$

d) Draw the diagraph of finite state machine whose state transition is **4**

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

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