

(3 Hours)

Total Marks: - 80

N.B.

1. Question no.1 is compulsory.
2. Attempt any three questions from the remaining five questions.
3. Figures to the right indicate full marks

1 (a) This of the following defines a relation on the set N of natural numbers. (10)  
 R1:  $x > y$ , R2:  $x + y = 10$ , R3:  $x + 4y = 10$  for all  $x, y \in N$ . Determine which of the relations are

- 1) reflexive
- 2) symmetric
- 3) antisymmetric
- 4) transitive

(b) Use a truth table to test the validity of the following argument. (5)  
 If you invest in the Gomeratic Corporation, then you get rich.  
 You didn't invest in the Gomeratic Corporation.  
 Therefore, you didn't get rich.

(c) Write the difference between MADM and MCDM. (5)

2 (a) Use SAW method and suggests the best alternatives? Where C1, C2, C3, C5 C6 are (10)  
 beneficial columns and C4 is no beneficial column.

Weight	0.2	0.1	0.1	0.1	0.2	0.3
	C1	C2	C3	C4	C5	C6
A1	2.0	1500	20000	4.5	5	9
A2	2.5	2700	18000	6.5	3	5
A3	1.8	2000	21000	4.5	7	7
A4	2.2	1800	20000	5.0	5	5

2 (b) Prove using mathematical induction that for all  $n \geq 1$ ,  $1 + 4 + 7 + \dots + (3n - 2) =$  (10)  
 $n(3n - 1)/2$ .

3 (a) Fast Track Ltd. Are evaluating four alternative single period investment (10)  
 opportunities whose returns are based on states of economy. Possible states of nature and associated probability distribution are given below.

State of Nature	Fair	Good	Great
Probability	0.2	0.5	0.3

The returns in Rupees for each investment opportunities and each state of nature are as follows.

Alternatives	State of Economy		
	Fair	Good	Great
AI	1000	3000	6000
AII	500	4500	6800
AIII	0	5000	8000
AIV	-4000	6000	8500

Construct decision tree and suggest the best alternative for investment.

(b) USE WPM and WSM Method to solve the following decision matrix. (10)

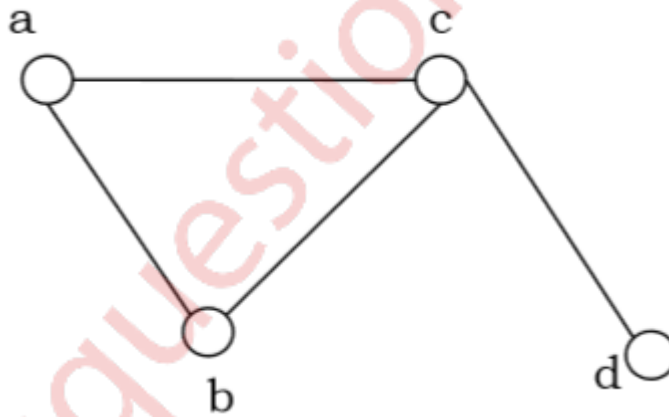
	$C_1$	$C_2$	$C_3$	$C_4$
Alts.	0.20	0.15	0.40	0.25
$A_1$	25	20	15	30
$A_2$	10	30	20	30
$A_3$	30	10	30	10

4 (a) Using Divide and Conquer compute the product of (10)  
 1)  $x=12345$  and  $y=6789$       2)  $x=8531$  and  $y=7289$

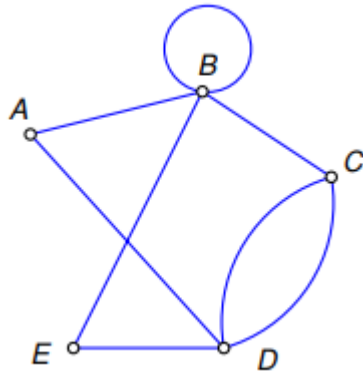
4 (b) Without using truth table prove that (10)  
 1)  $\square B \square (\square A \square B) \square (A \square B)$  is a tautology.  
 2)  $(Q \square P) \square (\square P \square Q)$  is a contradiction.

5 (a) What is the solution of the recurrence relation  $a_n = -a_{n-1} + 4a_{n-2} + 4a_{n-3}$  (10)  
 With  $a_0=8, a_1=6$  and  $a_2=26$ ?

(b) Find the adjacency list and adjacency matrix for the following graph (10)



- 6 (a) Find all the Euler Path and Euler Circuit for the following graph (10)



- (b) Construct the Hasse diagram of  $(P(\{a, b, c\}), \subseteq)$ . Also find Maximal, Minimal, Least and Greatest elements if it exists. (10)

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