

- N.B. (1) Question 1 is compulsory**  
**(2) Attempt any 3 from the from remaining 5 question**  
**(3) Use of Scientific calculator is not allowed.**  
**(4) Figures to right indicate full marks.**

**Q.1 (a)** Consider the following relations on  $\{1,2,3,4\}$ , Determine whether the given relation is reflexive, symmetric, and transitive? Also determines whether the relation is equivalence or not. **(10)**

$$R = \{(1,1),(1,2),(2,1),(2,2),(3,4),(4,3),(3,3),(4,4)\}$$

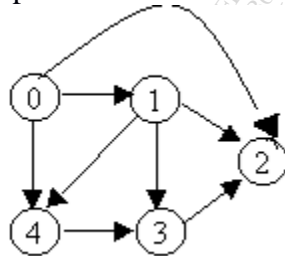
**(b)** Check whether the following are logically equivalent or not using truth table **(5)**

$$p \rightarrow (q \vee r) \equiv (p \rightarrow q) \vee (p \rightarrow r)$$

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

**Q.2 (a)** Using mathematical induction prove that the sum of first positive integers is  $n^2 + n$  i.e.  $2+4+6+8+\dots+(2n) = n^2 + n$  **(10)**

**(b)** Find adjacency lists and adjacency matrix for the following graph **(5)**



**(c)** A term life insurance policy will pay a beneficiary a certain sum of money on the death of the policy holder. These policies have premiums that must be paid annually. Suppose a life insurance company is considering selling a \$250,000 one-year term life insurance policy to a 49-year-old female for \$550. According to the National Vital Statistics Report, the probability the female will survive the year is 0.99791. Compute the expected value of this policy to the insurance company. **(5)**

**Q.3 (a)** Let  $A = \{1,2,3,4\}$ . Consider a relation  $R$  on  $A$  as  $\{(2,1),(3,1),(3,2),(4,1),(4,2),(4,3),(1,1),(2,2),(3,3),(4,4)\}$  Show that  $R$  is partial order relation. **(10)**

**(b)** Use SAW method to determine the best car. The beneficiary criteria are durability in Year and resale value, other are non beneficiary criteria. The measures of different criteria are given in the following table, **(10)**

Types of Car	Maintenance cost in Rs.	Purchase price in Rs.	Durability in Year	Resale value in Rs.
Car1	800	35000	6.5	100000
Car2	1000	1000000	10	450000
Car3	1250	650000	10	290000

The weights for different criteria are,

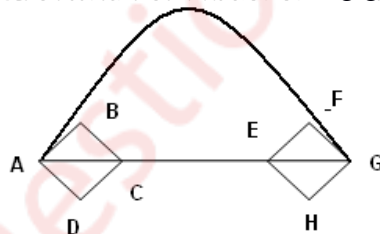
Types of Car	Maintenance cost in Rs.	Purchase price in Rs.	Durability in Year	Resale value in Rs.
Weight	0.15	0.4	0.25	0.2

- Q.4 (a)** If Horses fly or cows eat grass, then the Mosquito is the national birds. If Mosquito is national birds then peanut butter taste good on hot dogs. But peanut taste terrible on hot dogs. There for cow don't eat grass. Check argument is valid or not. **(10)**
- (b)** Derive an expression maximum number( $L_n$ ) of regions define by  $n$  lines in the plane. **(10)**

- Q.5 (a)** Find solution of the recurrence relation  $d_n = 4d_{n-1} - 4d_{n-2}$ , with initial condition  $d_1=1, d_2=7$  **(10)**
- (b)** A nature cream ltd wants to introduce new bran of ice cream in to market. The following alternatives are available to the company. **(10)**
- (i) Open five new outlets:** In this case if a demand is high, a profit of Rs. 70,000 p.m. is expected. If the demand is medium, a profit can be Rs. 52,000 and for low demand, it can be Rs. 35,000 only.
  - (ii) Open ten new outlets:** In this case the profit can be Rs. 1,40,000, Rs. 1,05,000 and Rs. 55,000 for demands being a high, medium, and low.

Past experience shows the probability of these demands as 0.25,0.45 and 0.3 respectively. Suggest the optimal decision for the company using Decision Tree method.

- Q.6 (a)** Find particular solution of the recurrence relation  $a_n + 5a_{n-1} + 6a_{n-2} = 42 \cdot 4^n$  **(10)**
- (b)** Find Euler circuit of following graph **(5)**



- (c)** Calculate WSM for the following data and suggest the best alternative **(5)**

Weights	0.50	0.15	0.20	0.15
	C1	C2	C3	C4
A1	20	20	15	20
A2	10	30	20	35
A3	30	10	30	10
A4	25	35	15	20

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