

- Note- 1 Question No.1 is Compulsory
2 Attempt any three Question between Question No.2 to 6

- Q1. (a) Prove following by contrapositive method of proof: 10
I. If a product of two positive real numbers is greater than 100, then at least one of the numbers is greater than 10.
II. For all integers m and n, if mn is even then m is even or n is even.
(b) Without using truth table prove $(P \rightarrow Q) \wedge (R \rightarrow Q) \equiv (P \vee R) \rightarrow Q$ 05
(c) What are the characteristics of a complex business problem, explain any two. 05
- Q2. (a) State and explain the number of Normal Forms 10
(b) Use induction to prove that the following identity holds for all integers $n \geq 1$:
 $1+3+5+\dots+(2n-1)=n^2$ 10
- Q3 (a) Let $A=\{1,2,3,4\}$ and $B=\{a,b,c\}$.
Let $R=\{(1,a), (1,b), (2,b), (2,c), (3,b), (4,a)\}$ and $S=\{(1,b), (3,b), (4,b)\}$
Compute (a) \bar{R} , (b) $R \cap S$, (c) $R \cup S$, (d) R^{-1} . 10
(b) In a screening test for a disease. The frequency of the disease in a population is 0.5%. The test is highly accurate with 5% false positive rate and 10% false negative rate. A person takes the test and it comes positive. Construct a decision tree and use Baye's theorem to determine the probability that he has a disease ? 10
- Q4 (a) State the "Tower of Hanoi" problem and obtain the recurrence relation for the same. 10
(b) Explain Vehicular Stopping Distance Modelling using decision theory. 10
- Q5 (a) In a class, 50% of all students play cricket and 25% of all students play cricket and volleyball. What is the probability that a student plays volleyball given that the student plays cricket? 10
(b) Solve the recurrence relation $an = 2an-1 - 2an-2$ with $a_0 = 1$ and $a_1 = 2$. 10
- Q6 (a) Difference between MADM and MCDM. 10
(b) Calculate normalized decision matrix from the following. 10

	C_1	C_2	C_3	C_4
A_1	25	20	15	30
A_2	10	30	20	30
A_3	30	10	30	10

Also find the normalized weights of the attributes.
