DISCRETE MATHEMATICS

Assignment-1

1	Check whether the following are tautologies or contradiction or contingency (i) $(((p \to q) \wedge (q \to r)) \to (p \to r)$ (ii) $(p \vee (q \wedge r)) \leftrightarrow ((p \vee r) \wedge (p \vee q))$
2	Prove that $\neg(p \vee (\neg p \wedge q))$and $\neg p \wedge \neg q$ are equivalent
3	Show that $R \vee S$ follows logically from the premises $C \vee D$, $(C \vee D) \to \neg H$, $\neg H \to (A \wedge \neg B)$ and $(A \wedge \neg B) \to R \vee S$
4	Find the PDNF and PCNF of the following (i). $(\neg P \to R) \wedge (Q \leftrightarrow P)$ (ii). $P \to ((P \to Q) \wedge \neg (\neg Q \vee \neg P))$
5	Test the validity of the following argument " If you work hard, you will pass the exam. You did not pass. Therefore you did not work hard"
6	Prove that the following argument is valid "All men are fallible. All kings are men. Therefore, all kings are fallible."
7	Explain the Warshall's algorithm and find the transitive closure of the relation R={(1,4),(2,1),(2,3),(3,1),(3,4),(4,3)} on A={1,2,3,4} using the same.
8	Draw the Hasse diagram representing the partial ordering {(a,b)| a divides b} on {1,2,3,4,6,8,12}.
9	If R be a relation in the set of integers Z defined by $R = \{(x, y): x \in Z, y \in Z, (x - y)\ is\ \ divisible\ by\ 6\}$.Then prove that R is an equivalence relation.
10	List the ordered pairs in the relation on {1,2,3,4} corresponding to the following matrix $\begin{bmatrix} 1 & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 \\ 1 & 0 & 0 & 1 \end{bmatrix}$, Also draw the digraph representing this relation. Use the graph to find if the relation is reflexive ,symmetric ,transitive.

11	The relation matrices of two relations R and S from A to B is given below $M_R = \begin{bmatrix} 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 1 & 1 & 1 & 0 \end{bmatrix}$, $M_S = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 1 \end{bmatrix}$ Determine the relation matrices of $R \cup S$, $R \cap S$, R^c, $\bar{S}$ where A={1,2,3}, B={1,2,3,4}
12	Let the recurrence relation be $a_n = 2^n + 5.3^n$. (i) Find first five terms of the recurrence relation. (ii) Show that $a_2 = 5a_1 - 6a_0$, $a_3 = 5a_2 - 6a_1$, $a_4 = 5a_3 - 6a_2$
13	Find the first five terms of $a_n = na_{n-1} + n^2 a_{n-2}$, $a_0 = 1, a_1 = 1$