

Bachelor of Computer Application (B.C.A.) Semester—I Examination

DISCRETE MATHEMATICS—I

Paper—IV

Time : Three Hours]

[Maximum Marks : 50

N.B. :— ALL questions are compulsory and carry equal marks.**EITHER**

1. (A) What is the truth table and statement formulas ? Write the steps to construct the truth table. 5

(B) Show that :

$$\neg(P \wedge Q) \rightarrow (\neg P(\neg P \vee Q)) \Leftrightarrow (\neg P \vee Q). \quad 5$$

OR

(C) Show that :

$$((P \vee Q) \wedge \neg(\neg P \wedge (\neg Q \vee \neg P))) \vee (\neg P \wedge \neg Q) \vee (\neg P \wedge \neg R)$$

is a tautology. 5

(D) Prove that $\{\wedge, \neg\}$ and $\{\vee, \neg\}$ are functionally complete. 5**EITHER**

2. (A) Obtain principal conjunctive normal form of formula :

$$(\neg P \rightarrow R) \wedge (Q \Rightarrow P). \quad 5$$

(B) Define DNF and CNF. Also describe the procedure to obtain DNF and CNF. 5

OR

(C) Obtain conjunctive normal form of :

$$\neg(P \vee Q) \Leftrightarrow (P \wedge Q). \quad 5$$

(D) Define PDNF. Discuss the truth table and replacement method to obtain PDNF. 5

EITHER

3. (A) Determine whether the conclusion C is valid for the premises H_1 , H_2 and H_3 .
 $H_1 : P \vee Q$, $H_2 : P \rightarrow R$, $H_3 : Q \rightarrow R$ and $C : R$. 5

(B) Show that $\neg(P \wedge Q)$ follows from $\neg P \wedge \neg Q$. 5**OR**

(C) What is theory of inference for statement calculus ? What are the rules of inference ? 5

(D) Demonstrate that R is valid inference from the premises $P \rightarrow Q$, $Q \rightarrow R$ and P. 5**EITHER**

4. (A) Show that :
 $(x)(H(x) \rightarrow M(x)) \wedge H(s) \Rightarrow M(s).$ 5

(B) Explain free and bound variables with respect to predicate calculus. Give an example. 5

OR

(C) Symbolise the expression “ALL the world loves a lover”. 5

(D) Define variable and quantifier. Also explain various types of quantifier. 5

5. Attempt **ALL** :

(A) Negate and simplify the following statement :

$$(P \vee Q) \wedge \neg(\neg P \wedge Q). \quad 2\frac{1}{2}$$

(B) Obtain PDNF of the following using truth table method :

$$(P \vee Q). \quad 2\frac{1}{2}$$

(C) Show that :

$$\neg Q, P \rightarrow Q \Rightarrow \neg P. \quad 2\frac{1}{2}$$

(D) What is universe of discourse ? Give one example. 2½