

TKN/KS/16/5953

Bachelor of Computer Application (B.C.A.)
Semester—I (C.B.S.) 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) Show that :

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

- (B) Construct the truth table for $(Q \wedge (P \rightarrow Q)) \rightarrow P.$ 5

OR

- (C) Given the truth value of P and Q as T and those of R and S as F, find the truth values of :

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

- (D) Show that :

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

EITHER

2. (A) Obtain the conjunctive normal form of :

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

(B) Obtain the principal disjunctive normal form of :

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

OR

(C) Obtain the principal conjunctive normal form of :

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

(D) Obtain the principal disjunctive normal form of
 $\neg P \vee Q.$ 5

EITHER

3. (A) Determine whether the conclusion C follows logically from premises H_1 and $H_2 :$

$$H_1 : P \rightarrow Q, \quad H_2 : \neg(P \wedge Q) \quad C : \neg P \quad . \quad 5$$

(B) Show that $R \vee S$ follows logically from the premises
 $C \vee D, (C \vee D) \rightarrow \neg H, \neg H \rightarrow (A \wedge \neg B),$ and
 $(A \wedge \neg B) \rightarrow (R \vee S).$ 5

OR

(C) Show that :

$$\neg Q, P \rightarrow Q \Rightarrow \neg P. \quad 5$$

(D) Show that $S \vee R$ is tautologically implied by :
 $(P \vee Q) \wedge (P \rightarrow R) \wedge (Q \rightarrow S).$ 5

EITHER

4. (A) Explain the following with respect to predicate calculus with one example of each :

- (i) Predicate formula
 - (ii) Free and bound variables
 - (iii) Universe of discourse
 - (iv) Statement function.
- 5

(B) Show that :

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

OR

(C) Show that :

$$(x)(H(x) \rightarrow M(x)) \wedge H(s) \Rightarrow M(s). \quad 5$$

(D) Show that $\neg P(a, b)$ follows logically from
 $(x)(y)(P(x, y) \rightarrow W(x, y))$ and $\neg W(a, b).$ 5

5. (A) Write the duds of :

- (i) $(P \vee Q) \wedge R$
- (ii) $\neg(P \vee Q) \wedge (P \vee \neg(Q \wedge \neg S)).$ 2½

(B) Obtain the product-of-sums canonical forms of :

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

(C) What are the rules of inference ? 2½

(D) Symbolize the expression “All the world loves a lover”. 2½