

**Bachelor of Science (B.Sc. I.T.) Semester—I (C.B.S.) Examination**  
**APPLIED MATHEMATICS—I**  
**Paper—VI**

Time : Three Hours]

[Maximum Marks : 50

- N.B. :—** (1) All questions are compulsory and carry equal marks.  
 (2) Draw neat and labelled diagram wherever necessary.

**EITHER**

1. (A) Show that

$$\neg(P \wedge Q) \rightarrow (\neg P \vee (\neg P \vee Q)) \Leftrightarrow (\neg P \vee Q)$$

without using the truth table.

5

- (B) Construct the truth table for

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

5

**OR**

- (C) Express
- $P \rightarrow (\neg P \rightarrow Q)$
- in terms of
- $\uparrow$
- only. Express the same formula in terms of
- $\downarrow$
- only. 5

- (D) Show that

$$(P \rightarrow (Q \rightarrow R)) \Rightarrow (P \rightarrow Q) \rightarrow (P \rightarrow R).$$

5

**EITHER**

2. (A) Show that a formula :

$$Q \vee (P \wedge \neg Q) \vee (\neg P \vee \neg Q) \text{ is a tautology by using conjunctive normal form.}$$

5

- (B) Obtain principal disjunctive normal form of

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

5

**OR**

- (C) Obtain principal disjunctive normal form of

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

5

- (D) Obtain conjunctive normal form of

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

5

**EITHER**

3. (A) Prove that R is a valid inference from the premises :

$$P \rightarrow Q, Q \rightarrow R \text{ and } P.$$

5

- (B) Show that the conclusion C follows from the premises
- $H_1$
- ,
- $H_2$
- and
- $H_3$

$$H_1 : \neg P \wedge Q \quad H_2 : \neg(Q \wedge \neg R) \quad H_3 : \neg R \quad C : \neg P$$

5

**OR**

- (C) Show that the following premises are inconsistent :

$$P \rightarrow Q, P \rightarrow R, Q \rightarrow \neg R, P$$

5

- (D) Show that
- $R \rightarrow S$
- can be derived from the premises :

$$P \rightarrow (Q \rightarrow S), \neg R \wedge P \text{ and } Q.$$

5

**EITHER**

4. (A) Show that :

$$(\forall x) (P(x) \vee Q(x)) \Rightarrow (\forall x) P(x) \vee (\exists x) Q(x) \quad 5$$

- (B) What are rules of generalization and specifications ? 5

**OR**

- (C) Show that :

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

- (D) Show that

$$(\exists x) (P(x) \wedge Q(x)) \Rightarrow (\exists x) P(x) \wedge (\exists x) Q(x) \quad 5$$

5. Attempt **ALL** :

- (A) Construct the truth table for

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

- (B) Obtain the principal disjunctive normal form of  $\neg P \vee Q$ . 2½

- (C) What are the rules of inference ? 2½

- (D) Symbolize the expression :

$$\text{“All the world loves a lover”}. \quad 2\frac{1}{2}$$