

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

1. (a) Construct the truth table for the formula

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

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

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

OR

- (c) Prove that
- $(P \rightarrow Q) \Leftrightarrow (\neg P \vee Q)$
- . 5

- (d) Prove that if
- H_1, H_2, \dots, H_m
- and P imply Q, then
- H_1, H_2, \dots, H_m
- imply
- $P \rightarrow Q$
- . 5

EITHER

2. (a) Obtain disjunctive normal form of

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

- (b) Find Conjunctive normal form of

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

OR

- (c) Obtain the principal disjunctive normal form of

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

- (d) Obtain the Principal conjunctive normal form of

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

EITHER

3. (a) Demonstrate that R is valid inference from the premises
- $P \rightarrow Q, Q \rightarrow R$
- , and P. 5

- (b) Show that
- $\neg (P \wedge Q)$
- follows from
- $\neg P \wedge \neg Q$
- . 5

OR

- (c) Show that $S \vee R$ is tautologically implied by $(P \vee Q) \wedge (P \rightarrow R) \wedge (Q \rightarrow S)$. 5
- (d) Show that the following premises are inconsistent :
- (1) If Jack misses many classes through illness, then he fails high school.
 - (2) If Jack fails high school, then he is uneducated.
 - (3) If Jack reads a lot of books, then he is not uneducated.
 - (4) Jack misses many classes through illness and reads a lot of books. 5

EITHER

4. (a) Indicate whether the following variables are free or bound, also show the scope :
 $(x) (P(x) \wedge R(x)) \rightarrow (x) P(x) \wedge Q(x)$. 5
- (b) Show that :
 $(x) (P(x) \rightarrow Q(x)) \wedge (x)(Q(x) \rightarrow R(x)) \Rightarrow (x)(P(x) \rightarrow R(x))$. 5

OR

- (c) Show that $(\exists x) M(x)$ follows logically from the premises :
 $(x) (H(x) \rightarrow M(x))$ and $(\exists x) H(x)$. 5
- (d) Show that :
 $(x) (p(x) \vee Q(x)) \Rightarrow xP(x) \vee (\exists x) Q(x)$. 5

5. Attempt **all** :
- (a) Construct the truth table for $P \wedge \neg P$. 2½
 - (b) What is maxterm ? 2½
 - (c) What are the rules of inference ? 2½
 - (d) Symbolize the statement :
"All men are gaints." 2½