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) Write an equivalent formula for

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

which does not contain the biconditionals. 5

(B) Prove that if $H_1, H_2, \ldots, H_m$ and P imply Q then $H_1, H_2, \ldots, H_m$ imply $P \to Q$. 5

OR

(C) Show :

$$\left(\neg P \wedge (\neg Q \wedge R)\right) \vee (Q \wedge R) \vee (P \wedge R) \Leftrightarrow R$$

without using truth table. 5

(D) If A(P, Q, R) is $\neg P \wedge \neg(Q \vee R)$ then find :

(i) $A^*(P, Q, R)$

(ii) $A^*(\neg P, \neg Q, \neg R)$. 5

EITHER

2. (A) Obtain principal disjunctive normal form of :

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

(B) Show that :

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

is a tautology by using conjunctive normal forms. 5

OR

(C) Obtain principal disjunctive normal form of $P \to \left((P \to Q) \wedge \neg(\neg Q \vee \neg P)\right)$. 5

(D) Obtain a conjunctive normal form $\neg(P \vee Q) \rightleftarrows (P \wedge Q)$. 5

EITHER

3. (A) Show that $S \vee R$ is tautologically implied by $(P \vee Q) \wedge (P \to R) \wedge (Q \to S)$. 5

(B) Show that $R \wedge (P \vee Q)$ is a valid conclusion from the premises

$P \vee Q,\ Q \to R,\ P \to M$ and $\neg M$. 5

OR

(C) Show that $R \to S$ can be derived from the premises $P \to (Q \to S)$, $\neg R \vee P$ and Q. 5

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

EITHER

4. (A) Show that :

$$(x)\,(P(x) \to Q(x)) \wedge (x)\,(Q(x) \to R(x)) \Rightarrow (x)\,(P(x) \to R(x)).$$ 5

(B) Show that :

$$(x)\,(P(x) \vee Q(x)) \Rightarrow (x)\,P(x) \vee (\exists x)\,Q(x).$$ 5

OR

(C) Show that $(\exists x)\,M(x)$ follows logically from the premises :

$(x)\,(H(x) \to M(x))$ and $(\exists x)\,H(x)$. 5

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

5. Attempt **all** :

(A) Define duality with example. 2½

(B) Define principal disjunctive normal form. 2½

(C) What are the rules of inference ? 2½

(D) Write that rules of generalization for the predicate calculus. 2½