Bachelor of Science (B.Sc. I.T.) Semester–I 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) What are logical connectives ? Explain negation, conjunction and disjunction connectives with example. 5

   (b) What is truth table ? Write steps to construct the truth table. 5

OR

   (c) Write and explain law of duality. 5

   (d) Without constructing the truth table prove the following is Tautology.

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

EITHER

2. (a) Discuss the types of normal forms. 5

   (b) Find the Disjunctive Normal Form (DNF) of the following : 5

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

OR

   (c) Obtain the cunjunctive normal form of

   $\neg(P \vee Q) \rightleftarrows (P \wedge Q)$ 5

   (d) Obtain the PDNF and PCNF of the formula using truth table method : 5

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

EITHER

3. (a) Determine whether conclusion C is valid for the set of premises H1, H2 and H3. H1 : $P \vee Q$, H2 : $P \rightarrow R$, H3 : $Q \rightarrow R$ and C : R 5

   (b) Discuss validity of arguments using truth table. 5

OR

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

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

EITHER

4. (a) Explain free and bound variables with respect to predicate calculus. 5

   (b) Show that $(\exists x)\, M(x)$ follows logically from the premises $(x)\, H(x) \rightarrow M(x)$ and $(\exists x)\, H(x)$. 5

OR

(c) Show that $(x)\,(H(x) \rightarrow M(x)) \wedge H(s) \Rightarrow M(s)$ 5

(d) Symbolize the expression "x is the father of the mother of y". 5

5. (a) Negate and simplify the statement $(P \vee Q) \wedge \neg(\neg P \wedge Q)$ 2½

(b) Define min-term and max term. 2½

(c) Show $\neg Q,\ P \rightarrow Q \Rightarrow \neg P$ 2½

(d) Identify the free and bound occurrences of the following statements.

(i) $(x)\,(P(x) \rightarrow (\exists y)\ R(x,y))$

(ii) $(x)\,(P(x) \rightarrow Q(x))$ 2½