Q.P. Code: 26436

Time: Three Hrs **Marks: 80**

Please check whether you have got the right question paper

N.B:

- Question Number one is compulsory.
- Solve any three from the remaining questions.

Q1. Solve **any four** from the following.

a) Prove the following logical equivalence (05M)

i) $A \vee (B \vee C) \equiv (A \wedge B) \vee (A \wedge C)$

ii) $A \rightarrow B \equiv \neg A \vee B$

b) Prove the following logical equivalence using Semantic Tableaux (05M)

i) $A \rightarrow B \equiv A \leftrightarrow (A \wedge B)$

ii) $A \Leftrightarrow B \equiv (A \vee B) \rightarrow (A \wedge B)$

c) Explain the terms Satisfiability, Validity and Consequence (05M)

d) Represent the following sentences by predicate calculus (05M)

i) Anything anyone eats and is not killed as a result is food.

ii) If you are killed you are not alive.

iii) Madhu eats everything Gopal eats.

e) Prove that there is a unique formation tree for every derivation tree. (05M)

Q2.

a) Explain the deductive system based on Gentzen system. Specify the rule of inference in the system. (10M)

b) Prove the following in Gentzen: (10M)

i) $\vdash (p \vee q) \rightarrow (q \vee p)$

ii) $\vdash p \vee (q \vee r) \rightarrow (p \vee q) \wedge (p \vee r)$

Q3.

a) Explain the Hilbert's system used in deductive system with an example. (10M)

b) Simplify the set of literals, i. e. for each set S find a simpler set S' such that S' is satisfiable if and only if S is satisfiable. (10M)

i) $[p\bar{q}, q\bar{r}, rs, p\bar{s}]$

ii) $[pq\bar{r}, \bar{q}, p\bar{r}s, qs, p\bar{s}]$

Q4.

a) Explain the Binary Decision Diagram (BDD) method for the formula $A = p \vee (q \vee r)$ and verify the same using Truth Table. (10M)

b) Prove the following using BDD (10M)

i) $\exists r\,(p \vee (q \wedge r)) = p \vee q$

ii) $\forall r\,(p \vee (q \wedge r)) = p$

Q5.

a) Describe in details the algorithm for Semantic Tableaux in Proportional Logic. Give one example for the same. (10M)

b) Express the following sentences in First Order Logic. (10M)

i) If an honest politician has given a promise he keeps the promise.

ii) If a party has given a promise, and a person is a leader of the party, then that means the party has given promise.

iii) If the person keeps his promise and he is the leader of the party then the party keeps its promise.

iv) If a person is the leader of a party then the person is a politician.

Q6. Write short notes on the following **(Any Two).** (20M)

a) Proportional Logic and First Order Logic.

b) Davis-Putnam Algorithm

c) Herbrand Models

d) Semantic Web Applications

****