Module-4

1. What are the problems with simulation based validation method.

2. Why Formal methods did not get acceptance in industry earlier.

3. What are the advantages of using formal methods for design verification?

4. Why it is difficult to use HOL in verification.

5. Try to find out major system design failure like Pentium Bug.

6. How the temporal logic is different from other classical logic like propositional logic and predicate logic.

7. Express the following information in temporal logic: P is true in next state, or the next but one.

8. Consider the fact: p is an atomic proposition. Write the temporal formula for p is infinitely often true. Give a model to show that this formula is true in all states.

9. Represent the information in temporal logic, “If P holds in a state then eventually in past Q holds”

10. Consider X = {p, q, r} be a set of atomic proposition. What is the power set of X.

11. Show a Kripke structure such that in a particular state EX (q or r) holds but EX(q and r) does not hold.

12. Show a Kripke structure such that in a particular state AF (q or r) holds but EF(q and r) does not hold.

13. In the semantics of CTL, we have considered that “future includes the present also”. Redefine the semantics of CTL such that future excludes the present.

14. Express the following properties in CTL:

   a) It is possible to get a state where started holds, but ready does not hold.

   b) For any state, if a request (of some resource) occurs, then it will eventually be acknowledged.

   c) A certain process is enabled infinitely often on every computation path.

   d) From any state it is possible to get a restart state.
15. When we say that two CTL formulas are semantically equivalent?

16. Which of the following pairs of CTL formulas are equivalent:

   - EFp and EGp
   - EFp \lor EFq and EF(p \lor q)
   - AFp \lor AFq and AF(p \lor q)
   - AFp \land AFq and AF(p \land q)
   - EFp \land EFq and EF(p \land q)
   - AG(p \land q) and AGp \land AGq
   - T and AGp \rightarrow EGp
   - T and EGp \rightarrow AGp

17. Show that the following two formulas are equivalent

   \( E(Fp \land Fq) \) and  \( (EF(p \land EFq) \lor EF(q \land EFP)) \)

Are these CTL formulas?