SYCS/SEM IV/REG/Theory of Computation

Time: 2½ hrs. **Marks:75**

Note:
1. All questions are compulsory with internal choice.
2. Draw neat diagrams wherever necessary.
3. Figures to the right indicate full marks.

Q.1 Answer the following (any four) **(20)**

(a) How does an automaton process input symbols?
(b) What is a transition function in a finite automaton?
(c) Explain the concept of e-transitions in NFA.
(d) What is the difference between a Mealy Machine and a Moore Machine?
(e) What is a formal grammar?
(f) What is the Chomsky hierarchy of languages?

Q.2 Answer the following (any four) **(20)**

(a) What is a regular expression (RE)?
(b) Convert the finite automaton below into a regular expression (example needed).
(c) Write a regular expression for the language containing all strings over {a, b} with an even number of a's.
(d) What are the limitations of the Pumping Lemma?
(e) What are the two methods of acceptance by a PDA?
(f) Construct a finite automaton equivalent to the regular expression (01+10)*(01+10)^*(01+10)*.

Q.3 Answer the following (any four) **(20)**

(a) What is a Linear Bounded Automaton (LBA)?
(b) Define a Turing Machine formally.
(c) Define the transition function of an LBA.
(d) State the Church-Turing thesis.
(e) What is the Halting Problem, and why is it undecidable?
(f) Explain how reductions are used to prove undecidability.

Q.4 Answer the following (any five) **(15)**

(a) What is an automaton?
(b) Define regular grammar.
(c) Define Nondeterministic Finite Automaton (NFA).
(d) What is a Pushdown Automaton (PDA)?
(e) What are the components of a Turing Machine?
(f) Define the states of LBA

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