2119

B.E. 4th Semester (CSE) Examination, May-2010

THEORY OF AUTOMATA AND COMPUTATION

Paper–CSE–206–E

Time allowed : 3 hours]   [Maximum marks : 100

Note : Attempt **five** questions. All questions carry equal marks.

1. (a) Prove the following formula :   10

    (a) $(aa^* bb^*)^* = \wedge + a(a + b)^* b$

    (b) $(aaa^*)^* = (aa + aaa)^*$

    (b) Show by an example that for some regular language L, any FA recognizing L must have more than one accepting states. Characterize those regular languages for which this is true.   10

2. (a) Write the Arden's method to convert an NFA to DFA. Illustrate with some example.   15

    (b) What are the limitations of FSM ?   5

3. What do you mean by pumping lemma ? Using the concept of Pumping Lemma prove the following :

(a) that the language $L = \{a^n b^n \mid n > 1\}$ is not regular

(b) that the set $L = \{a^p \mid p$ is prime number$\}$ is not regular. 20

4. (a) Let G be the grammar

$S \rightarrow aS \mid aS\,bS \mid \in$ $\in$: epsilon

Prove that

$L\,(G) = \{x \mid$ each prefix of x has atleast as many a's as b's$\}$.

(b) Let G be the grammar

$S \rightarrow aB \mid bA$ $A \rightarrow a \mid aS \mid bAA$

$B \rightarrow b \mid bS \mid aBB$

For the string aaabbabbba fina

(i) leftmost derivation (ii) parse tree. 10

5. Construct a PDA equivalent to the following grammar

$S \rightarrow aAA$, $A \rightarrow aS \mid bS \mid a$

find whether the string ababb will be accepted by it or not.   20

(a) Design Turing machines to recognize the string with an equal number of 0's and 1's.   14

(b) Write a short note on PCP problem.   6

(a) If L is a context sensitive language, then prove that L is accepted by some linear bounded automata.   10

(b) Prove the equivalence of type O grammars and Turing machines.   10

(a) Show that fibonacci numbers are generated by a primitive recursive function.   10

(b) Show that the function $f(x, y) = x * y$ is primitive recursive.   10