Reg. No. : ☐☐☐☐☐☐☐☐☐☐☐☐☐

V 4549

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2008.

Fifth Semester

Computer Science and Engineering

CS 1303 — THEORY OF COMPUTATION

(Regulation 2004)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define automaton.

2. What is the principle of mathematical induction?

3. Construct a DFA for the regular expression aa*/bb*.

4. Construct a DFA over Σ = (a, b) which produces not more than 3 a's.

5. Let S → aB/bA

    A → aS/bAA/a

    B→ bS/aBB/b.

    Derive the string aaabbabba as left most derivation.

6. What is meant by empty production removal in PDA?

7. State the pumping lemma for CFG.

8. Define turing machine.

9. What is meant by halting problem.

10. What is post correspondence problem?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Prove that for every integer $n \geq 0$ the number $4^{2n+1} + 3^{n+2}$ is a multiple of 13. (8)

    (ii) Construct a DFA that will accept strings on $\{a, b\}$ where the number of b's divisible by 3. (8)

    Or

    (b) Construct a finite automaton that accepts the set of all strings in $\{a, b, c\}^*$ such that the last symbol in input string appears earlier in the string. (16)

12. (a) Construct a regular expression to the transition diagram. (16)
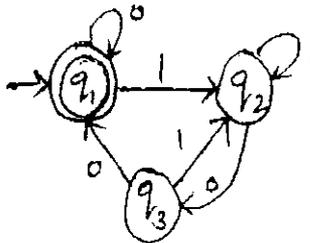
    Or

    (b) Construct a NFA for the regular expression (a/b)*abb and draw its equivalent DFA. (16)

13. (a) Construct a CFG accepting $L = \{a^m b^n / n < m\}$ and construct a PDA accepting L by empty store. (16)

    Or

    (b) Convert the grammar with productions into CNF $A \rightarrow bAB / \lambda$, $B \rightarrow BAa / \lambda$. (16)

14. (a) Design a deterministic turing machine to accept the language $L = \{a^i b^i c^i / i \geq 0\}$. (16)

    Or

    (b) Determine whether the language given by

    $L = \{a^{n^2} / n \geq 1\}$ is context free or not. (16)

15. (a) Prove that the function $f_{add}(x, y) = x + y$ is primitive recursive. (16)

    Or

    (b) Show that there exists a TM for which the halting problem is unsolvable. (16)