CS-73

BACHELOR IN COMPUTER APPLICATIONS

Term-End Examination

June, 2007

CS-73 : THEORY OF COMPUTER SCIENCE

Time : 3 hours *Maximum Marks : 75*

Note : *Question number 1 is* ***compulsory****. Attempt any* ***three*** *questions from the rest.*

1. (a) Define Post's Correspondence Problem (PCP) with an example. 5

(b) Design a Turing Machine which computes $m - n$, where m and n are positive integers and $m \geq n$. 7

(c) Use Pumping lemma for regular sets to prove that the language

$$L = \left\{ a^{i^2} \,\middle|\, i \geq 1 \right\}$$

is not regular. 5

(d) Describe halting problem of Turing Machine. 5

(e) Describe Chomsky's classification of grammars. 6

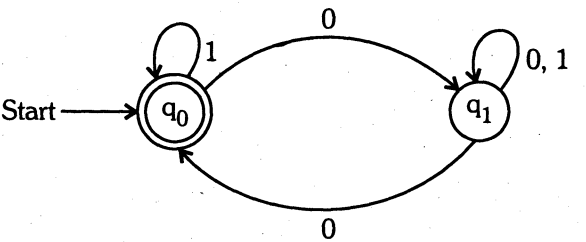
(f) Differentiate between O and o (big O and small o). 2

2. (a) Describe how NP-completeness of a problem can be established. *7*

(b) Let L_1 and L_2 be the two recursive languages. Show that their intersection $L_1 \cap L_2$ is also recursive. *8*

3. (a) Explain in detail as to how subroutines are handled in a Turing Machine. *8*

(b) Construct a DFA equivalent to the following NFA : *7*



Draw the state diagram for the constructed DFA.

4. (a) Construct finite automata for the following regular expression : *8*

$$10^*(0 + 1)\ (01 + 10)^*\ 110^*$$

(b) Convert the following Mealy machine to Moore machine : *7*

	Input symbol		Output
	a	b	
q_0	q_2	q_3	0
q_1	q_3	q_1	1
q_2	q_1	q_0	0
q_3	q_1	q_2	1

5. (a) Design Turing Machine to compute the function n^2, where n is a +ve integer greater than or equal to one. 5

(b) Prove that CFLs are not closed under complementation. 5

(c) Design a push down automata to accept the language 5

$$L = \{a^n b^n \mid n \geq 1\}$$