No. of Printed Pages : 3

CS-73

BACHELOR OF COMPUTER APPLICATIONS (PRE-REVISED)

05429

Term-End Examination

June, 2014

CS-73 : THEORY OF COMPUTER SCIENCE

Time : 3 hours *Maximum Marks : 75*

Note : *Q. No. 1 is **compulsory**. Attempt **any three** from the rest.*

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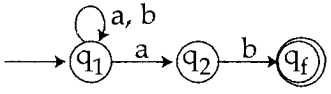
1. (a) Convert following NFA to DFA : **5**



(b) Write regular expression for the following regular sets : **3+3=6**

(i) {00, 001, 0011, 00111, ... }

(ii) set of all strings over {0, 1} containing at the most one 0.

(c) Convert the following context free grammar to Chomsky Normal Form : **5**

$S \rightarrow aAbB \quad A \rightarrow Ab/b \quad B \rightarrow Bb/a$

(d) Write a short note on halting problem of Turing machines. **5**

(e) Differentiate between a recursive and recursively enumerable language. **5**

(f) For $F(x) = 2x^3 + 3x^2 + 1$ prove that **4**

$F(x) = 0\ (x^n)$ for $n \geq 4$

2. (a) Design a Turing machine to accept the language. 6

$L = \{\omega\ \omega^R / \omega$ is a string over {a, b}$\}$

ω^R is the reverse of ω

(b) Describe the concept of Universal Turing Machine (UTM). 4

(c) A proper subtraction function is defined as follows : 5

sub $(x, y) = x - y$ if $x \geq y$

sub $(x, y) = 0$ if $x < y$

Show that proper subtraction function is primitive recursive.

3. (a) Write short on NP Hard and NP complete problems. Show that the clique problem is NP complete. 12

(A k-clique is a subset of k vertices in a graph such that vertex in the subset is connected to all other vertices in that subset).

(b) Describe any one application of finite automation. 3

4. (a) Design a push down automation for the following context free grammar : 5

$S \rightarrow aB/bA \quad A \rightarrow aS/bAA/a$

$B \rightarrow bS/aBB/b$

(b) Design a push down automation to implement the language : 5

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

(c) Prove that if the languages L_1 and L_2 are context free then the language 5

$L = L_1 L_2$ is also context free.

5. (a) Convert the following Moore Machine to equivalent Mealy machine : 5

Current State	Input symbol		Output
	a	b	
$\rightarrow q_0$	q_3	q_2	0
q_1	q_0	q_1	1
q_2	q_2	q_0	1
q_3	q_2	q_1	0

(b) Design a DFA corresponding to regular expression 1*(10)* 5

(c) State and prove pumping lemma for regular sets. 5