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CS-73

BACHELOR OF COMPUTER APPLICATIONS (BCA) (Pre-Revised)

Term-End Examination

01775 **June, 2016**

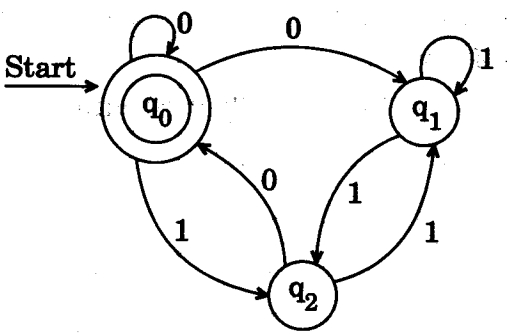
CS-73 : THEORY OF COMPUTER SCIENCE

Time : 3 hours *Maximum Marks : 75*

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

1. (a) Prove the theorem : If L is a finite language, then L can be defined by a regular expression. *5*

(b) For the NDFA shown, check whether the input string 0100 is accepted or not. *5*



(c) Construct CFG for the given set *5*

$\{ 0^{m,n} \mid 1 \leq m \leq n \}$.

(d) Discuss about PDA acceptance : 7

(i) From empty stack to final state

(ii) From final state to empty stack

(e) Is it possible that a Turing Machine could be considered as a computer of functions from integers to integers ? If yes, justify your answer. 4

(f) (i) Show that $3n + 2 = O(n)$. 2

(ii) Show that $3n + 2 = \Omega(n)$. 2

2. (a) Construct a NFA transition diagram and its equivalent DFA to $M = (Q, \Sigma, \delta, q_0, F)$, where $Q = \{q_0, q_1\}$, $\Sigma = \{0, 1\}$, $F = \{q_0\}$ and δ is given as : 10

States	Inputs	
	0	1
q_0	$\{q_0, q_1\}$	$\{q_1\}$
q_1	$\{q_0\}$	$\{q_0, q_1\}$

(b) Prove that if L and M are regular languages, then $L \cap M$ is also a regular language. 5

3. (a) Given a CFG $G = (N, T, P, S)$ with

$N = \{S\}$, $T = \{a, b, c\}$ and

$$P = \left\{ \begin{array}{l} (1)\ S \rightarrow aSa \\ (2)\ S \rightarrow bSb \\ (3)\ S \rightarrow c \end{array} \right\}.$$

Obtain the derivation tree and language generated L(G). 8

(b) Check whether the language given by $L = \{a^m b^m c^n : m \leq n \leq 2m\}$ is a CFL or not. 7

4. (a) Explain the following with examples :

(i) Multi-Tape Turing Machine 5

(ii) K-dimensional Turing Machine 5

(b) Show that the function $f(x) = x^2$ is primitive recursive. 5

5. (a) Explain any two undecidable problems with respect to Turing Machine. 10

(b) Show that the vertex cover problem is NP-complete. 5