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CS-73

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

Term-End Examination

01103 **December, 2018**

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) Design a transducer (Moore/Mealy machines) that gives a 1 as its output, if and only if the last three digits are 1's. Assume that $\Sigma = \{0, 1\} = 0$. *10*

(b) Prove that the set of regular languages is closed under complementation. *5*

(c) Check whether the language given by

$L = \{w \in \{a, b, c\}^* \mid n_a(w) = n_b(w) = n_c(w)\}$

is not context free. *5*

(d) Let $g(x, y) = 2^x + y - 3$. Find $H_y[g(x, y) = 0]$. *5*

(e) Discuss the applications of regular expression. *5*

2. (a) Construct a finite automata accepting all strings over {0, 1}

(i) having odd number of 0's, and

(ii) having even number of 0's and even number of 1's. *10*

(b) Construct a PDA accepting

$\{a^n b^m a^n \mid m, n \geq 1\}$ by empty stack. *5*

3. (a) Eliminate unit productions from the grammar (G) given by production (P). *5*

$S \rightarrow AB$

$A \rightarrow a$

$B \rightarrow C \mid b$

$C \rightarrow D$

$D \rightarrow E$

$E \rightarrow a$

(b) Using Pumping Lemma, show that the language

$$L = \{a^i b^j c^k \mid i = j = k \text{ and } i, j, k \geq 1\}$$

is not context free. *10*

4. (a) Write short notes on the following : *2×5=10*

(i) Two-way Turing Machine

(ii) Non-deterministic Turing Machine

(b) Prove that if L_1 and L_2 are recursively enumerable languages then $L_1 \cup L_2$ is also recursively enumerable. *5*

5. (a) (i) Define Post's Correspondence Problem (PCP). *2*

(ii) Does PCP with two lists

A = (1, 01, 0, 001), and

B = (10, 101, 101, 0)

have a solution ? *3*

(b) Show that the clique problem is an NP-complete problem. *10*