(Please write your Exam Roll No.) Exam Roll No. .....

END TERM EXAMINATION

FOURTH SEMESTER [B.TECH] MAY-JUNE 2018

Paper Code: ETCS-206 **Subject: Theory of Computation (Batch 2013 Onwards)**

Time: 3 Hours **Maximum Marks: 75**

Note: Attempt any five questions including Q no.1 which is compulsory. Assume missing data if any.

Q1 (a) What is Finite Automation? Differentiate between DFA and NFA? **(5)**

(b) Construct a DFA over the alphabet {0, 3}, such that number of 0's in the string is always even. **(5)**

(c) Construct a PDA accepting the set of all even-length palindromes over a, b by empty store. **(5)**

(d) State Church's Hypothesis about computability of a machine. **(5)**

(e) Prove that graph coloring problem is NP-complete. **(5)**

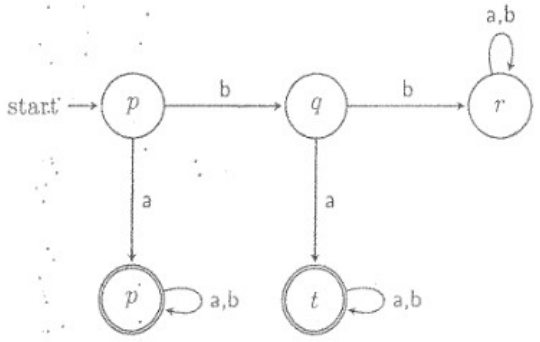
Q2 (a) State and prove Kleen's Theorem. **(6.25)**

(b) Construct a Mealy machine which is equivalent to the More machine given in Table 1. **(6.25)**

Table 1: Transition table for Mealy machine

Present State	Next State a=0	Next State a=1	Output
→q_0	q_1	q_2	1
q_1	q_3	q_2	0
q_2	q_2	q_1	1
q_3	q_0	q_3	1

Q3 (a) Minimize the following FDA: **(6.25)**



(b) Construct a DFA equivalent to the NFA M whose transition table is given in Table 2. **(6.25)**

Table 2: Transition table of NFA M

Present State	0	1	2
→q_0	q_1, q_4	q_2	q_2, q_3
q_1	-	q_4	-
q_2	q_1, q_3	-	q_2, q_4
q_3	-	q_4	-
q_4	-	q_1, q_3	-

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Q4 (a) State and Pumping Lemma for Context Free languages. **(6.25)**
(b) Construct a PDA to find the 2's- complement of binary number. **(6.25)**

Q5 (a) Construct a DFA equivalent to the grammar $S \to aS|bS|aA, A \to bB, B \to aC, C \to A$. **(6.25)**

(b) Reduce the grammar $S \to AB, A \to a, B \to C|b, C \to D, D \to E, E \to a$ to Chomsky Normal Form. **(6.25)**

Q6 (a) Construct a Turing machine that enumerates $\{0^n 1^n \mid n \geq 1\}$. **(6.25)**

(b) Construct a Turing machine for the language $\{a^n b^n c^n \mid n \geq 1\}$. **(6.25)**

Q7 (a) Explain Universal Turing Machine with the help of an example. **(6.25)**
(b) Explain recursive and recursively enumerable languages and the relationship between them. **(6.25)**

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