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

END TERM EXAMINATION

FIFTH SEMESTER [B.TECH] DECEMBER 2016 – JANUARY 2017

Paper Code: IT-301 **Subject: Theory of Computation**

Time: 3 Hours **Maximum Marks: 60**

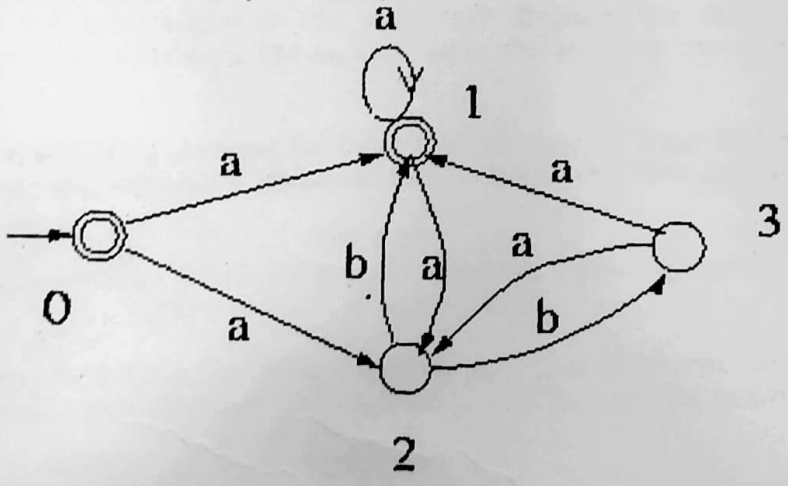
Note: Attempt any five questions including Q.no.1 which is compulsory. Select one question from each Unit.

Q1 (a) Write formal statement of kleen's theorem. **(2.5x8=20)**
(b) Define pumping lemma for context free language?
(c) Define Chomsky normal form of a CFG?
(d) What is LL(2) grammar? How is it different from LL(1).
(e) What is halting problem?
(f) Define Oracle turing Machine.
(g) What is time hierarchy theorem?
(h) Define probabilistic computation and BPP complexity class.

Unit-I

Q2 (a) State Pumping property followed by a regular language and prove that $L = \{a^n b^{2n} \mid n>=1\}$ is non-regular. **(5)**
(b) Prove by construction that regular languages are closed under intersection. **(5)**

Q3 (a) Prove or Disprove the validity of the following statement "Every NDFA (Non-deterministic Finite Automata) can be converted into DFA (deterministic Finite Automata) by increasing the number of states". **(5)**
(b) Find the equivalent regular expression of following Finite Automata with set of states as {0, 1, 2, 3}: **(5)**



Unit-II

Q4 (a) Show that context free languages are closed under union and concatenation. **(5)**
(b) Prove that intersection of regular and context free language will always be context free. **(5)**

Q5 (a) Design a Pushdown Automata to recognize language $L = \{a^n b^{2n} \mid n>=1\}$. **(5)**
(b) Describe the mechanism to find equivalent CFG of a given PDA. **(5)**

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Unit-III

Q6 How can we combine different Turing machines. Design a Turing Machine to recognize a language L = {SS | S $\in$ {a, b} * }. **(10)**

Q7 Discuss any two variant of the standard Turing machine. Design a Turing Machine to Compute F(n) = 1 + 2 + ... + n (represent n in unary) i.e F(3) = 6. **(10)**

Unit-IV

Q8 Write your comment on the implications of knowing an exact relationship that is "equality" or "Non-equality" in between P and NP complexity classes. Briefly outline the proof of Cook's Theorem. **(10)**

Q9 Define SPCAE and NSPCAE Complexity classes. Prove that PSPCAE is equivalent to NPSPACE. **(10)**

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