(Please write your Exam Roll No.)

END TERM EXAMINATION

FIFTH SEMESTER [B.TECH] DECEMBER 2019

Paper Code: IT 301 **Subject: Theory of computation**

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

Note: Attempt five questions including Q. NO. 1 which is compulsory. Select one question from each unit.

Q1. Attempt any five of the following: **(5*5=25)**

a) Prove that $L=\{a^n b^n \mid n>=1\}$ is non-regular.

b) Show that the context free languages are not closed under intersection

c) What is probabilistic Turing machine?

d) Prove that a problem solvable in the space of O(f(n)) requires worst case time of the order of $O(2^{f(n)})$ [*Make necessary assumptions*].

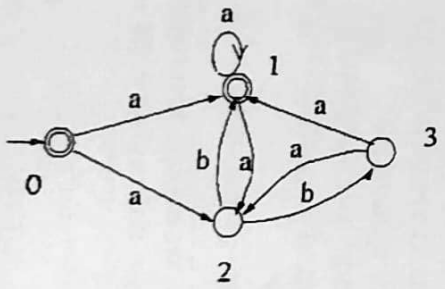
e) Prove that vertex cover problem is poly-time reducible to clique problem.

f) What is parsing? Define LL(1) parsing technique.

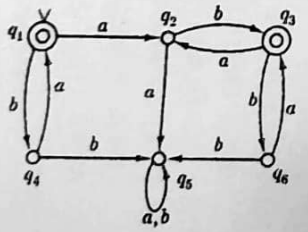
g) Define any two variants of standard turing machine.

Unit-I

Q2. Differentiate in between deterministic and non-deterministic finite automata. Convert following NDFA into DFA. **(12.5)**



Q3. Explain the process of minimizing number of states of a DFA. Minimize the number of states of following DFA. **(12.5)**



Unit II

Q4. What is context free grammar? Explain pumping lemma for context free language through an example. **(12.5)**

Q5. Define Pushdown automata (PDA). Create a pushdown automaton that accepts the language $\{0^{2n}1^n \mid n > 0\}$. Show that your PDA accepts **000011** and that it rejects **0001.** **(12.5)**

Unit III

Q6. Can you write a program which outputs itself? if 'yes' then give an example. Define Recursion theorem and show that construction of **'SELF'** Turing machine is possible. **(12.5)**

Q7. Differentiate in between computationally intractable and Undecidable problems. Prove that Halting problem is undeciadable. **(12.5)**

Unit IV

Q8. Define IP and BPP complexity classes? Prove that $NSPACE(f(n)) = SPACE(f(n)^2)$. **(12.5)**

Q9. Discuss the proof outline of Cook-levin theorem. State whether following statements are TRUE or FALSE with justifications. **(12.5)**

(a) Some problems in NP complete can not be transformed into satisfiability problem in Polynomial time.

(b) Non deterministic RAM may give different results for the same decision problem.

(c) A problem with exponentially possible solutions can only be in P if P=NP.

d) Every problem who solution requires exponential time on the deterministic RAM can be made to run in polynomial time on deterministic RAM.

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