

D 2014

Name.....

Reg. No.....

FL I SEMESTER M.Sc. DEGREE EXAMINATION, DECEMBER 2009

Computer Science (Main)

CS 104—THEORETICAL COMPUTER SCIENCE

(2005 Admissions)

Time : Three Hours

Maximum : 80 Marks

Part A

Answer any **five** questions.

1. Define a finite automata and its language. Give an example. Also find the regular expression.
2. State pumping lemma for regular sets. Show that $\{a^i b^i / i \geq 1\}$ is not regular.
3. Find the reduced CFG equivalent to $S \rightarrow aS \mid AB, A \rightarrow B \rightarrow E, D \rightarrow b$.
4. State pumping lemma for CFG and show that $\{a^i b^i c^i / i \geq 1\}$ is not CFL.
5. Define TM and describe ID. What is the language of the TM ?
6. State and provide informal proof for Chomsky's hierarchy.
7. Find the disjunctive normal form of $(\neg P \vee \neg Q) \wedge (P \wedge R)$.

(5 x 8 = 40 marks)

Part B

Answer any **four** questions.

8. State Kleen's theorem and outline the proof.
9. Find the reduced state DFA that accepts $(0 + 11) 0^* 1$.
10. Construct a CFG for the language $\{a^i b^i / i \geq 1\}$ and hence find a PDA.
11. Write a note on the halting problem in TM.
12. Discuss P, NP, NP-complete problems giving examples of each type.
13. (a) By constructing suitable universe of discourse show that $\exists x (P(x) \rightarrow Q(x)) \rightarrow (\exists x P(x) \rightarrow \exists x Q(x))$ is not valid.
(b) Show that the following arguments is valid.
(i) All men are mortal. (ii) Socrates is man.
(iii) So Socrates is mortal.

(4 x 10 = 40 marks)