Reg. No. : .....

Name : .....

Sixth Semester B.Tech. Degree Examination, May 2012
(2008 Scheme)
Branch : Computer Science and Engg.
08.603 : FORMAL LANGUAGES AND AUTOMATA THEORY

Time : 3 Hours Max. Marks : 100

PART – A

Answer **all** questions.

1. Define a DFA formally.
2. What is a Mealy machine ? Give an example.
3. Prove that $L = \{x \in (0, 1)^* \mid x = x^R\}$ is not regular (Here x^R denotes the reverse of string x).
4. Design a DFA over $\Sigma = \{0, 1\}$ which accepts the set of all strings that either starts with 01 or ends with 01.
5. When is a grammar said to be ambiguous ? Check whether the CFG with production $S \rightarrow SbS / a$ is ambiguous.
6. Explain useless symbols. Give two aspects for usefulness.
7. What is Backus Naur Form ? Give a grammar in BNF for the set of palindromes over {0, 1}.
8. Formally describe the language accepted by a Turing machine.
9. Design a Turning Machine to find one's complement of a number.
10. Define Instantaneous Description (ID) for a Turning Machine. **(10×4=40 Marks)**

PART – B

Answer **any one** from **each** Module.

Module – I

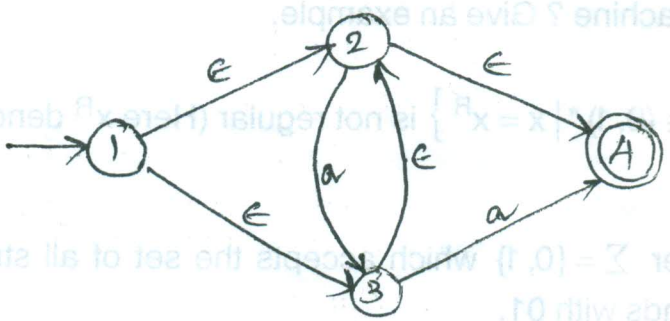
11. a) State and prove the equivalence of NFA with and without $\in$ -transitions. **10**

b) i) State the pumping lemma for regular sets. What are its applications ? **4**

ii) Prove that $L = \{0^n 1^m \mid n \leq m\}$ is not regular. **6**

OR

12. a) Convert the following NFA with $\in$ -transitions into NFA without $\in$ -transitions. **10**



b) State and prove the equivalence of NFA and DFA. **10**

Module – II

13. a) Explain the Chomsky hierarchy of languages. **10**

b) What is Greibach Normal Form ? Convert the grammar with following productions into GNF :

$S \rightarrow AB$

$A \rightarrow BS / b$

$B \rightarrow SA / a$ **10**

OR

14. a) Design a PDA accepting $\{a^n b^m a^n \mid m, n \geq 1\}$ by empty store. 10

b) i) When is a grammar said to be in Chomsky Normal Form ?

ii) Find an equivalent grammar in CNF for the following grammar ({S, A, B}, {a, b}, P, S) that has the productions :

$S \rightarrow bA / aB$

$A \rightarrow bAA / aS / a$

$B \rightarrow aBB / bS / b$ 10

Module – III

15. a) Design a Turing Machine to compute factorial (n). 15

b) What is a Universal Turing Machine ? 5

OR

16. a) Design a Turing Machine to perform proper-subtraction (1); m | n is defined to be m – n, for $m \geq n$ and

0 , for $m < n$ 10

b) State and prove the equivalence of single tape and multitape turing machine. 10