

Code : 051611

B.Tech 6th Semester Exam., 2015

FORMAL LANGUAGES AND  
AUTOMATA THEORY

Time : 3 hours

Full Marks : 70

Instructions :

- (i) The marks are indicated in the right-hand margin.  
 (ii) There are **NINE** questions in this paper.  
 (iii) Attempt **FIVE** questions in all.  
 (iv) Question No. 1 is compulsory.

1. Define any seven of the following :  $2 \times 7 = 14$ 

- ~~(a)~~ Applications of automata theory  
~~(b)~~ Finite automata  
~~(c)~~ Transition graph  
~~(d)~~ Epsilon transition  
 (e) Regular expression  
 (f) Regular language  
~~(g)~~ Turing acceptable  
~~(h)~~ Mealy machine  
 (i) Reducibility  
 (j) Enumerable language

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2. (a) Design an FA that accepts set of strings containing exactly four 1's in every string over alphabets  $\Sigma = \{0, 1\}$ . 7  
 (b) Design an NFA for the language  $L =$  all strings over  $\{0, 1\}$  that have at least two consecutive 0's or 1's. 7
3. (a) Design a deterministic finite automata which accepts set of strings such that every string containing "00" as sub-string but not "000" as sub-string. 7  
 (b) Show that if  $L$  is regular, so  $L - \{\epsilon\}$  will be also regular. 7
4. (a) Write a regular expression over alphabets  $\{a, b, c\}$  contains at least one "a" and at least one "b". 7  
 (b) Prove that  $L = \{0^1 1^m \mid n \leq m\}$  is not regular language. 7
5. (a) What do you mean by closer properties of regular language? Define some important closer properties. 7  
 (b) Prove that, if  $L_1$  and  $L_2$  is regular, then  $L_1 \cup L_2$  is also regular language. 7

( Turn Over )

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6. (a) Explain ambiguities in context free grammar and languages. 7

(b) Find context free grammar for the regular expression  $r = (a + b)^*$ . 7

7. (a) Show that the following grammar is ambiguous : 7

$$S \rightarrow AB / aaB$$

$$A \rightarrow a / Aa$$

$$B \rightarrow b$$

(b) Define parse tree with its applications in finite automata. 7

8. (a) What do you mean by push down automata? Explain its move. 7

(b) Using pumping lemma, prove that language  $L = \{WW / W \in \{a, b\}^*\}$  is not context free. 7

9. (a) Explain turing machine for computing function. 7

(b) Write in brief about NP complete problem. 7

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