

BACHELOR IN COMPUTER APPLICATIONS

Term-End Examination
June, 2012

CS-73 : THEORY OF COMPUTER SCIENCE

Time : 3 hours

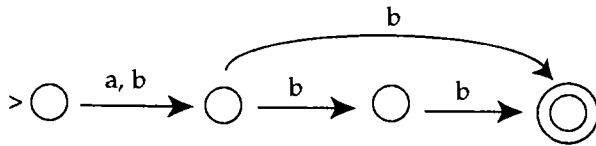
Maximum Marks : 75

Note : Question no. 1 is compulsory.
Attempt any three questions from the rest.

- 1. (a) Tabulate chomsky hierarchy of grammar with examples. 5
(b) Briefly describe Universal Turing Machine. 5
(c) If L is recursive, show that L-bar is also recursive. 4
(d) Using parse tree show that the grammar : 4
S -> S+S | S\*S | a is ambiguous
Use a + a\*a as the string
(e) List three applications of finite Automata. 3
(f) Convert the following Regular expression into FA : 5
(a + b) \* (aa + bb) (a + b)\*
(g) When can a problem be termed as undecidable ? Explain with example. 4

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2. (a) Derive FA from the following NFA : 5



- (b) Convert the following Regular expression into a FA : 5

$$a^*(ba)^*b^*$$

- (c) Give Regular Expression for all strings that do not end in a double letter. 5

3. (a) Show that the language : 6

$$L = \{a^n b^n : n \geq 0\} \text{ is not regular.}$$

- (b) Design a TM that accepts all strings over alphabet  $\Sigma = \{a, b\}$  whose second letter is b. 5

- (c) Explain with example Non Deterministic Turing Machine (NDTM). 4

4. (a) Build a PDA for language described as : 5

$$L = \{a^m b^m \mid m \geq 1\}$$

- (b) Show that the language : 5

$$L = \{a^n b^n c^n : n \geq 0\} \text{ is not context free.}$$

- (c) Show that the function is primitive recursive 5

$$f(m, n) = \begin{cases} m - n & \text{if } m \geq n \\ 0 & \text{else} \end{cases}$$

5. (a) If  $f(x) = 2x^3 + 3x^2 + 1$  6  
then show that  
 $f(x) = 0 \pmod{x^3}$   
and also  
 $f(x) = 0 \pmod{x^2}$ .
- (b) What is meant by time complexity and 3  
space complexity of a problem ?
- (c) Explain how a finite Automata can be used 6  
to search information on world wide web ?
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