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CS-73

01932

BACHELOR IN COMPUTER APPLICATIONS

Term-End Examination

June, 2011

CS-73 : THEORY OF COMPUTER SCIENCE

Time : 3 hours *Maximum Marks : 75*

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

1. (a) What do you understand by the following ? Explain each with an appropriate example : **2+2+2+2=8**

(i) Regular expression

(ii) Context Free Grammar

(iii) NFA

(iv) Pumping Lemma

(b) Build a Finite Automata that accepts only those words that have an even no of sub strings ab. ($\Sigma = \{a, b\}$) **4**

(c) For $\Sigma = \{a, b\}$ **2**

Give a regular expression that has all strings that end in a double letter

(d) Find a grammar for the language of odd palindromes over {a, b}. **2**

(e) Design a TM that recognises the strings of even length over {a, b}. 2

(f) Explain the practical and geometrical interpretation of the following growth rate notations : 4

O (big oh) ; Θ (theta) : o (little oh or small oh)

(g) Show that 3

$$n^2 + 3\log n = O(n^2)$$

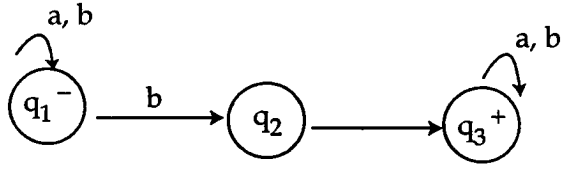
(h) State any three decision problem which are unsolvable. 5

2. (a) Tabulate chomsky hierarchy of grammar with examples. 5

(b) Convert the following regular expression into a finite Automata. 5

$(a + b)^*\ (aa + bb)\ (a + b)^*$

(c) Derive a finite Automata from the following NFA 5



3. (a) Show that L described as follows is not regular $L = \{ww : w \Sigma \{a, b\}^*\}$ 6

(b) Describe the operation of Turing machine which uses a two way infinite tape. 5

(c) What are the applications of finite Automata ? Explain with an appropriate examples. 4

4. (a) Build a PDA for the language described as $\{ww^R : w \Sigma \{a, b\}^*\}$ 5

(b) Show that the language 5

$\{a^{n^2} | n \geq 1\}$ is not context free.

(c) Show that the function is primitive recursive 5

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

5. (a) Show that the state entry problem is undecidable 4

(b) If $f(n) = 2n^2 + 3n^2 + 1$ 6

then show that

$$f(n) = w(n)$$

and also

$$f(n) = w(n^2)$$

(c) Show that K-colorability problem is NP. 5