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CS-73

BACHELOR OF COMPUTER APPLICATIONS
(Pre-Revised)

01174

Term-End Examination

December, 2014

CS-73 : THEORY OF COMPUTER SCIENCE

Time : 3 hours *Maximum Marks : 75*

Note : *Question number **1** is **compulsory**. Attempt any **three** questions from the rest.*

1. (a) If languages L_1 and L_2 are regular, show that their union $L = L_1 \cup L_2$ is also regular. *5*

(b) Convert the following Mealy machine to equivalent Moore machine : *5*

Current State	Symbol Input	Output	Symbol Input	Output
$\rightarrow q_0$	q_1	1	q_2	1
q_1	q_2	0	q_0	1
q_2	q_0	1	q_1	0

(c) Write the context free grammar to create palindrome over {a, b}. *4*

(d) Design a Turing Machine to compute the sum of two positive integers m and n. *5*

(e) Prove that "If a language L is recursive then its complement $\overline{L}$ is also recursive". *5*

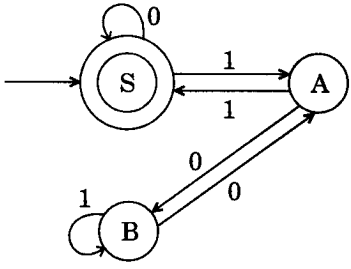
(f) Cite examples of any four NP complete problems. *2*

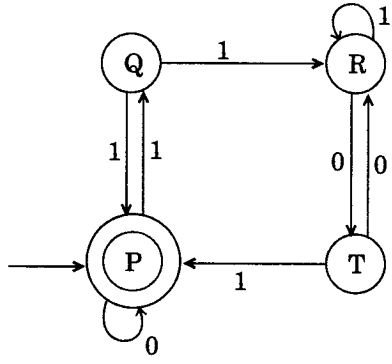
(g) Show that the sum function f(x, y) = x + y is primitive recursive. *4*

2. (a) Use pumping lemma for regular sets to prove that the language $L = \{a^p \mid p \text{ is prime}\}$ is not regular. *5*

(b) Construct finite automaton corresponding to the regular expression (a + b)* c d*e. *4*

(c) Determine whether the following finite automata are equivalent : *6*





3. (a) Explain how can context free grammar be used to describe the syntax of an assignment statement in programming language. (Assignment statement example a = b + c * d) *6*

(b) Design a push down automaton to accept the language $L = \{a^w b^{n+2} \mid n \geq 1\}$. *4*

(c) Convert the following grammar to Chomsky Normal Form : *5*

$S \rightarrow aA \mid bB \quad A \rightarrow bAA \mid a \quad B \rightarrow BBa \mid b$

4. (a) Explain the multitape version of Turing machine and its significance. *5*

(b) Explain Chomsky Hierarchy of grammars, with an example. *5*

(c) Show that the diagonalisation language L_d is not Turing acceptable. *5*

5. (a) Write a short note on Post Correspondence problem. *5*

(b) Show that the Halting problem of Turing machine is undecidable. *5*

(c) Describe the concept of reduction. How is it used to establish the NP completeness of a problem ? *5*