Registration No. : | | | | | | | | | | |

Total number of printed pages – 3

B. Tech

PECS 5304

Fifth Semester Regular Examination – 2014

THEORY OF COMPUTATION

BRANCH(S) : CSE, IT

QUESTION CODE : H 221

Full Marks – 70

Time : 3 Hours

*Answer Question No. **1** which is compulsory and any **five** from the rest.*

The figures in the right-hand margin indicate marks.

1. Answer the following questions : 2×10

(a) Define NFA mathematically. Design an NFA intuitively which accepts set of all strings containing 3rd symbol from right side is 1.

(b) Write a regular expression for set of all strings whose 2nd bit from the right end is 1 and 4th bit from the right end is 0.

(c) Show that $S \rightarrow a|Sa|bSS|SSb|SbS$ is ambiguous.

(d) What do you mean by a decidable problem ?

(e) Obtain the grammar to generate the language $L = \{ w : | w | \bmod 5 = 0\}$ over $\Sigma = \{0,1\}$.

(f) Discuss the Chomsky's Hierarchy of Grammars with examples.

(g) State Church-Turing hypothesis.

(h) Differentiate between PDA and DFA.

P.T.O.

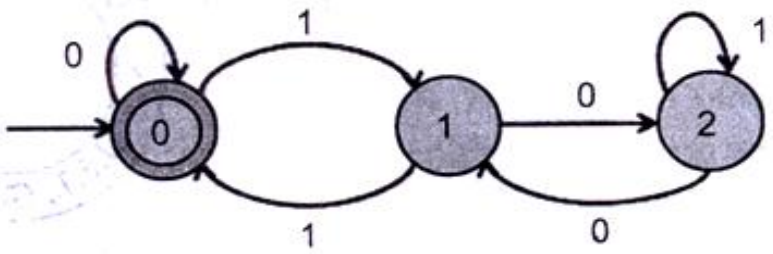
(i) What is primitive recursive function ? Represent the addition of two integer numbers in primitive recursive functions ?

(j) State Pumping Lemma for regular set.

2. (a) Prove the language over alphabet {a,b,c} $L = \{ a^i b^i c^i \mid i > 0 \}$ is a non-context free language. 5

(b) Language over ={0,1}*, such that every string is a multiple of 3 in binary. The suggested DFA for the given problem is given below. Construct the equivalent Regular Expression from this DFA using Arden's theorem. 5

Where 0, 1, 2 in circles represents the remainders.



3. (a) Show that the PDA that accepts the language $L = \{w \varepsilon \{a,b\}^* | n_a = n_b\}$ is nondeterministic. First construct the PDA for the language then test. 5

(b) Let $\Sigma = \{0,1,+,=\}$ and ADD = {x = y + z| x,y,z are binary integers, and x is the sum of y and z}. Show that ADD is not regular. 5

4. Construct the minimized DFA from the regular expression for which accepts all inputs starting with double letters (aa, bb) or ending with double letters (aa, bb), given $\Sigma = \{a,b\}$ is the alphabet set of the given language. Write the complete steps starting from regular expression to NFA and finally to minimized DFA for the problem. 10

5. (a) Compute the Godel number for the following sequence : 5

(i) 3,0,1

(ii) 2,0,0,1

(iii) 2,0,1,3

(iv) 1,1,1,2,0

(b) What is an Ackerman's function ? By defining the Ackerman's function find out the values of

(i) A (3, 4)

(ii) A (4, 2). 5

6. (a) What is GNF ? Bring the grammar G with V = {S,A,B},T = {a,b} and productions P 5

$S \rightarrow AB$

$A \rightarrow BSB$

$A \rightarrow a$

$B \rightarrow b$

(b) Give the upper diagonal matrix produced by the CYK algorithm for the given grammar. 5

$S \rightarrow AB \mid BC$

$A \rightarrow BA \mid a$

$B \rightarrow CC \mid b$

$C \rightarrow AB \mid a$

7. (a) Define a TM in ordered seven-tuple specification with brief descriptions of terms. Construct a TM over the alphabet {0, 1} that contains set of strings of 0's and 1's except those containing the substring 001. 5

(b) Construct a TM to compute n^2. 5

8. Write short notes on any two the following : 5×2

(a) PCP (Post's Correspondence Problem)

(b) Early's Parsing

(c) Time Complexity class P, NP and NP complete

(d) Parikh's Theorem.
