Code: 13A05404 **R13**

B.Tech II Year II Semester (R13) Supplementary Examinations December 2016

FORMAL LANGUAGES & AUTOMATA THEORY

(Computer Science and Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) Give the formal definition of Finite Automata.

(b) Write the regular expressions for the following languages:

(i) All the strings of a's and b's where every string ends with 'abab'

(ii) All the strings which begin or end with either 00 or 11 over the set { 0 ,1}

(c) Define the language for the following Context Free Grammars.

(i) $S \rightarrow 0\ S\ 1 \mid 01$

(ii) $S \rightarrow a\ S\ a \mid b\ S\ b \mid \varepsilon$

(d) List any four closure properties of regular languages.

(e) Differentiate Recursive and Recursive enumerable languages.

(f) Explain briefly about two stack PDA.

(g) Show that the following grammar is ambiguous:

S->aSbS|bSaS|ε

(h) Construct NFA for the following regular expression: (00+11)*.

(i) Briefly explain about Chomsky hierarchy of languages.

(j) State Post Correspondence Problem (PCP).

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 Construct DFA for the following Languages:

(i) The set of all strings over {0,1} having even number of 0's and odd number of 1's.

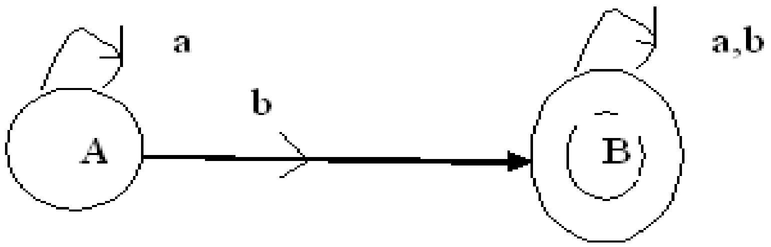
(ii) The set of all strings over {0,1} where evrey string doesnot ending with 011.

OR

3 Construct a Moore machine to determine residue mod 5 for a binary number and convert it into its equivalent Mealey machine.

UNIT – II

4 State Arden's theorem and construct the regular expression for the following FA using Arden's theorem.



OR

5 State pumping lemma for regular languages and prove that the following languages are not regular by using pumping lemma.

(i) $L = \{a^p \mid \text{where p is a prime}\}$.

(ii) $L = \{ a^n b^n \mid n>0 \}$.

Contd. in page 2

UNIT – III

6 Convert the following Context Free Grammar to Chomsky Normal Form.

$S \rightarrow bA \mid aB$

$A \rightarrow bAA \mid aS \mid a$

$B \rightarrow aBB \mid bS \mid b$

OR

7 What is meant by left recursion in CFG and check the following grammar is left recursive or not if it is, remove it.

$E \rightarrow E+T \mid T$

$T \rightarrow T*F \mid F$

$F \rightarrow id$

UNIT – IV

8 Design a PDA whose language is {w | w contains balanced parenthesis}.

OR

9 Convert the following PDA into its equivalent CFG.

The transition function is defined as:

$\delta(q_0, 0, Z_0) = \{(q_0, 0Z_0)\}$

$\delta(q_0, 0, 0) = \{(q_0, 00)\}$

$\delta(q_0, 1, 0) = \{(q_1, \varepsilon)\}$

$\delta(q_1, 1, 0) = \{(q_1, \varepsilon)\}$

$\delta(q_1, \varepsilon, Z_0) = \{(q_2, \varepsilon)\}$

UNIT – V

10 What is Turing Machine? Specify its model and construct TM for the language.

$\mathbf{L=\{a^m b^n a^{m+n} \mid n \geq 1\ m \geq 0\}}$

OR

11 Explain various types of Turing Machines with examples.

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