

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)

- 1 Answer the following: (10 X 02 = 20 Marks)
- Give the formal definition of Finite Automata.
 - Write the regular expressions for the following languages:
 - All the strings of a's and b's where every string ends with 'abab'
 - All the strings which begin or end with either 00 or 11 over the set { 0, 1 }
 - Define the language for the following Context Free Grammars.
 - $S \rightarrow 0 S 1 \mid 01$
 - $S \rightarrow a S a \mid b S b \mid \epsilon$
 - List any four closure properties of regular languages.
 - Differentiate Recursive and Recursive enumerable languages.
 - Explain briefly about two stack PDA.
 - Show that the following grammar is ambiguous:
 $S \rightarrow aSbS \mid bSaS \mid \epsilon$
 - Construct NFA for the following regular expression: $(00+11)^*$.
 - Briefly explain about Chomsky hierarchy of languages.
 - State Post Correspondence Problem (PCP).

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

UNIT – I

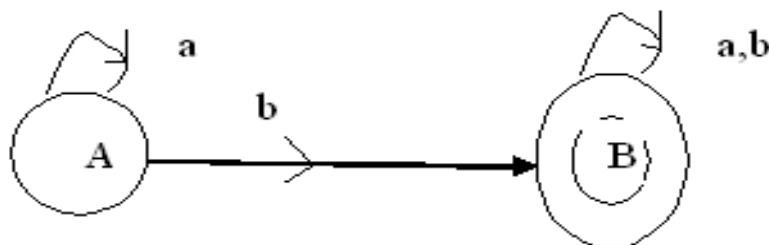
- 2 Construct DFA for the following Languages:
- The set of all strings over {0,1} having even number of 0's and odd number of 1's.
 - The set of all strings over {0,1} where every string does not end with 011.

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.
- $L = \{a^p \mid p \text{ is a prime}\}$.
 - $L = \{a^n b^n \mid n > 0\}$.

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.

$$E \rightarrow E+T \mid T$$

$$T \rightarrow T * F \mid F$$

$$F \rightarrow \text{id}$$

UNIT – IV

- 8 Design a PDA whose language is $\{w \mid w \text{ contains balanced parenthesis}\}$.

OR

- 9 Convert the following PDA into its equivalent CFG.

The transition function is defined as:

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

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

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

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

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

UNIT – V

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

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

OR

- 11 Explain various types of Turing Machines with examples.
