Code: 13A05404 **R13**

B.Tech II Year II Semester (R13) Regular Examinations May/June 2015

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) What is a string? How to concatenate two strings?

(b) What is context free grammar?

(c) Describe the language generated by the regular expression: $(a+b)^*aaa(a+b)^*$.

(d) Let r_1 be the regular expression representing the language L_1, r_2 be the regular expression representing the language L_2, what is the language represented by the regular expression $r_2 + r_1$.

(e) Identify the language generated by context free grammar: $S \rightarrow (S)|()|SS$.

(f) Define ambiguous grammar with example.

(g) Can push down automata accept the regular language?

(h) Give any two examples of languages that are accepted by PDA.

(i) Define linear bounded automata.

(j) Define multi-tape Turing machine.

PART – B

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

UNIT – I

2 (a) Construct the language generated by grammar $S \rightarrow aSb/\varepsilon$.

(b) Construct the language generated by the grammar $S \rightarrow aCa; C \rightarrow aCa/b$.

OR

3 Design a minimal DFA over the alphabet $\Sigma = \{0,1\}$ to accept the language $L = \{w|w \cong 0 \ mod \ 3\}$.

UNIT – II

4 State and prove Arden's theorem.

OR

5 (a) Write the identities of regular expressions.

(b) Draw the NFSA to accept the languages generated by aa^*bb^*

UNIT – III

6 (a) Remove unit productions in the following grammar:

$S \rightarrow ABaC$

$A \rightarrow BC$

$B \rightarrow b|\in$

$C \rightarrow D|\in$

$D \rightarrow \in$

(b) Remove unit productions in the following grammar:

$S \rightarrow aSb$

$S \rightarrow A$

$A \rightarrow cAd$

$A \rightarrow cd$

OR

7 Define Chomsky normal form, convert the following grammar into CNF:

$S \rightarrow bA|aB;\ A \rightarrow bAA|aS|a;\ B \rightarrow aBB|bS|a.$

UNIT – IV

8 Construct a PDA that accepts the language generated by the following grammar: $S \rightarrow aB;\ \ B \rightarrow bA/b;\ \ A \rightarrow aB.$

OR

9 Construct a PDA to accept the language $L = \{WCW^R/W \in (a,b)^+\}$ by the empty stack.

UNIT – V

10 Design a Turing machine to accept the language $= \{a^n b^n, n \geq 1\}$. Show an ID for the string 'aaabbb' with tape symbols.

OR

11 Write short notes on: (i) Instantaneous Description of TMs. (ii) Recursively Enumerable and Recursive Languages.

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