Code: 13A05404

R13

B.Tech II Year II Semester (R13) Regular & Supplementary Examinations May/June 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) Define the terms symbol, string and Language.

(b) Write short notes on proof by contradiction.

(c) Differentiate between Klean closure and positive closure.

(d) If R_1 and R_2 are two regular languages, $R_1 \cup R_2$ and $\overline{R_1}$ and $\overline{R_2}$ are also regular languages, prove by DeMorgans rules that $R_1 \cap R_2$ is also a regular language.

(e) For the grammar E→E+E, E→E*E, E→id, construct a parse tree (using leftmost derivation) for the string id*id*id+id.

(f) List the set operators under which CFLs are NOT CLOSED. Justify your answer.

(g) Explain how a stack is integrated into the functioning of a PDA.

(h) Give the formal definition of a PDA.

(i) Explain the functioning of a counter machine.

(j) State the closure properties of recursive languages.

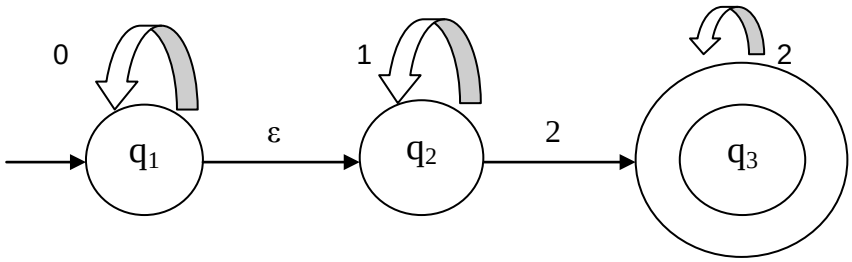
PART – B

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

UNIT – I

2 (a) Construct the NFA for the RE $(0+1)^*(00+11)\ (01)\ (0+1)^*$.

(b) For the following ε-NFA, construct its equivalent NFA without ε transitions.



OR

3 (a) Construct a Moore machine that takes strings comprising 0, 1, 2 and 3 as input (base 4 number) whose decimal equivalent modulo 7 is given as output.

(b) How do we determine equivalence of two DFA? Explain with an example

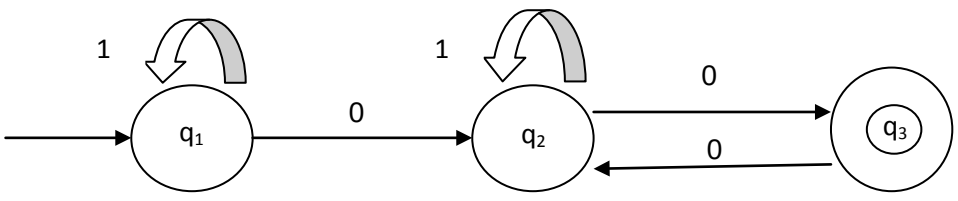
UNIT – II

4 (a) State and prove Arden's Theorem

(b) List the closure properties of Regular Languages

OR

5 Find the regular expression corresponding to the following DFA.



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UNIT – III

6 Convert the following grammar into GNF:

$X \rightarrow YZ \quad Y \rightarrow ZX \mid a \quad Z \rightarrow XY \mid b$

OR

7 (a) Explain the following terms with example:
(i) Ambiguous Grammar.
(ii) Left Recursion.
(iii) Chomsky's Normal Form.

(b) Discuss the closure properties of Context free languages.

UNIT – IV

8 (a) Construct a PDA that recognizes strings (over alphabet 0 and 1) that contain equal number of 0s and 1s.

(b) Construct a grammar in Chomsky's Normal Form that is equivalent to:

$A \rightarrow aBCb, B \rightarrow bC, C \rightarrow Cb, C \rightarrow b.$

OR

9 (a) Construct a PDA that recognizes strings of WW^r form, where W^r is the reverse of W, and strings comprise of 0s and 1s. Give the instantaneous of the PDA also.

(b) Construct a PDA that recognizes strings of type $0^n1^m \mid n>m$ using final state.

UNIT – V

10 (a) Explain the concept of Universal Turing Machine.

(b) Find a PCP solution for the following sets.

A	B
ab	aba
ba	abb
b	ab
abb	b
a	bab

OR

11 Construct a Turing Machine that computes the product of two numbers, represented in Unary form.

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