**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.

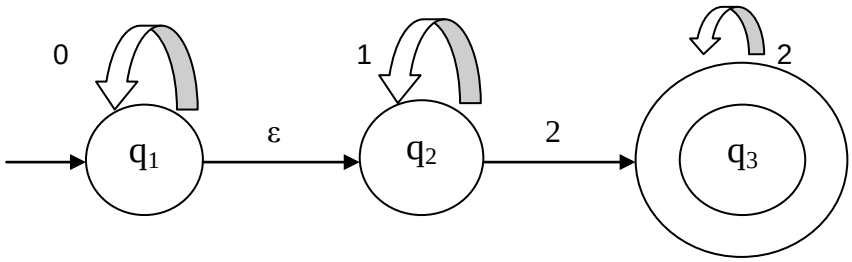
**PART – B**

(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

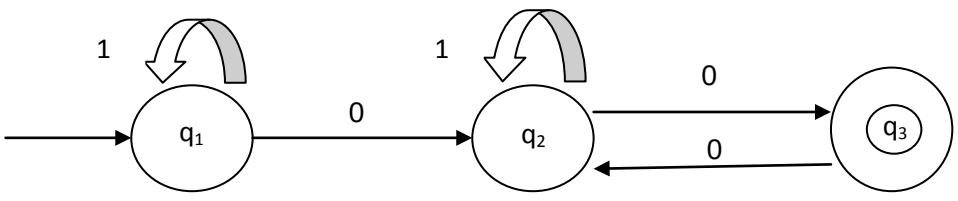
**UNIT – II**

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→YZ Y→ZX | a Z→XY | 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→aBCb, B→bC, C→Cb, C→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 $0^n1^m$ | 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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