Code No: R22055 **R10** SET - 1

II B. Tech II Semester Supplementary Examinations January – 2014
FORMAL LANGUAGES AND AUTOMATA THEORY
(Computer Science and Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. Describe the following:
   a) Alphabet, String, Language, Empty String. b) NFA.
   c) Transition Diagram. d) **δ** in NFA with **ε** (Epsilon) moves

2. a) Write an algorithm to minimize a given FA
   b) Minimize the following FA

S	0	1
→ a0	a0	a3
a1	a2	a5
a2	a3	a4
a3	a0	a5
a4	a0	a6
a5	a1	a4
(a6)	a1	a3

3. a) Design a Moore Machine to determine the residue mod 4 for each binary string treated as integer.
   b) Design a Mealy machine that uses its state to remember the last symbol read and emits output '**y**' whenever current input matches to previous one, and emits n otherwise.

4. Construct the Left Linear Grammar for the following Regular Expressions:
   a) (11+0)* (00+1)*
   b) 10+ (0+11)0*1

5. Design DPDA for the language L={ $\mathbf{a^n b^{2n}}$ / **n>0**}

6. a) Explain in brief the properties of recursive and recursively enumerable languages
   b) Prove that PCP is undecidable

7. Design Turing Machine over ∑={1} to accept the language L={1^m/m is odd}

8. Write about:
   a) Multi tape Turing Machine b) NP Hard and NP Complete problem
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Code No: R22055 **R10** SET - 2

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1. Define and explain briefly about the following:
   a) A Deterministic Finite State Automaton.
   b) Notation For configuration for such an automaton.
   c) The notation such that an automaton produces output ' *u'* on input '*w'*.
   d) The notation such that an automaton computes a function

2. a) Construct NFA for given NFA with Є –moves Figure 1.

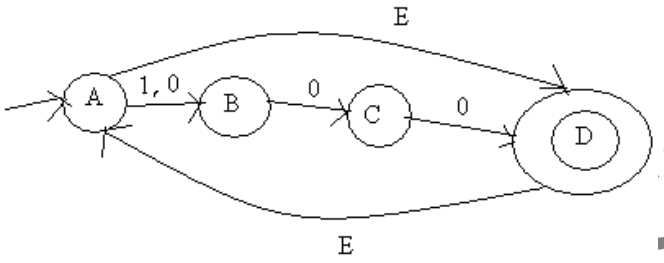


Figure 1.

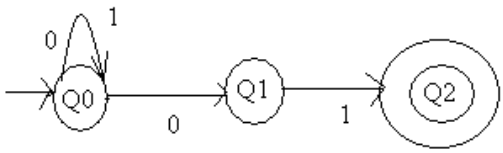
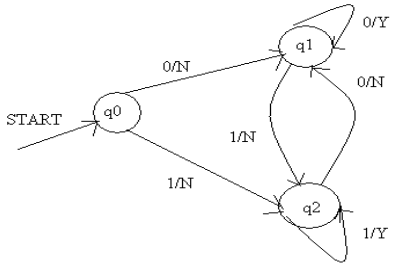


Figure 2.

   b) Construct DFA for given NFA Figure 2.

3. a) Design a Moore machine to determine the residue mod 5 for each ternary string (base3) treated as ternary integer.
   b) Convert the following Mealy machine into equivalent Moore machine.



4. Construct Minimum state DFA for the following Regular expression ((ab)* U (bc)*)ab

5. a) Give CFG for generating odd palindromes over the string {a,b}
   b) Design PDA for L={WCW^R /W€(0+1)*

6. Write and explain Closure properties of CFL's

7. Design Turing Machine for the language L= {$\mathbf{a^n b^n c^n}$ / n>1 }

8. Discuss about:
   a) Church's hypothesis b) NP Problems

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Code No: R22055 **R10** SET - 3

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Time: 3 hours Max. Marks: 75

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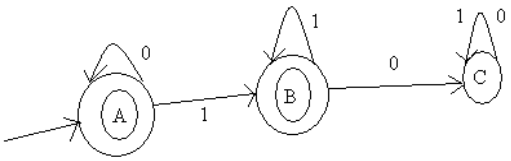
1. Describe the following:
   a) Operations on sets
   b) Relation and its properties
   c) Prefix, suffix, concatenation, empty string
   d) DFA

2. a) Show that for every NFA there exists an equivalent DFA.
   b) Construct DFA equivalent to the NFA $\{p,q,r,s\},\{0,1\},\delta_2,p,\{q,s\}\}$

	0	1
P	Q,S	Q
Q	R	Q,R
R	S	P
S	--	P

3. Give a regular expression for the set of all strings over {a, b} accepting all strings which have number of a's divisible by 6 and number of b's divisible by 8.

4. a) Obtain regular grammar for the following FA



   b) What is the language accepted by above FA?

5. Convert the following Grammar into CNF
   S → AbcD / abc
   A→ aASB / d
   B→ b/ cb
   D→ d

6. Write and Explain Closure Properties of Regular sets.

7. Design Turing Machine over $\sum=\{0,1\}$ to accept the language $L=\{0^m1^m/m>0$

8. Write Short Notes on:
   a) Turing Machine b) Undecidability c) Universal Turing Machine.
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Code No: R22055 **R10** SET - 4

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Time: 3 hours Max. Marks: 75

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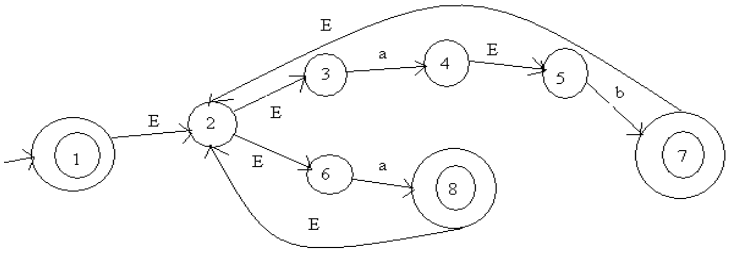
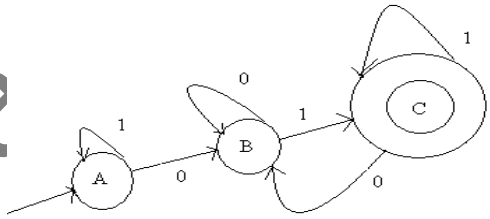
1. a) Design DFA which accepts even no. of 0's over { 0 , 1 }
   b) Design DFA which accepts Language L={100,101}

2. For the following NFA with Є -moves convert it in to an NFA without Є -moves and show that NFA with Є -moves accepts the same language.



3. Construct FA for the following regular expressions
   a) (0+1)*(1+00)(0+1)* b) 0+10* +01*0

4. a) Obtain a Right Linear Grammar for the language L = $\{a^n b^m \mid n>=2 , m>=3\}$
   b) Obtain a Left Linear Grammar for the DFA shown below.



5. Convert the following Grammar into GNF
   $E \rightarrow E+T / T$
   $T \rightarrow T * F / F$
   $F \rightarrow (E) / a$

6. Construct PDA for the Language L={w c wR | w Є (a +b) * , where w^R is reverse of w }.

7. a) Design Turing Machine for the language L= { $\mathbf{a^n b^n c^n}$ / n>1 }
   b) State and prove Rice's theorem

8. Write short note on:
   a) Post Correspondence problem. b) LR(0) Grammar.
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