ST.ANN'S COLLEGE OF ENGINEERING AND TECHNOLOGY, CHIRALA

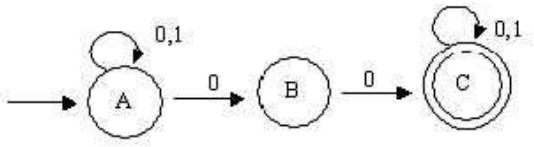
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

ASSIGNMENT QUESTIONS

SUB: FLAT YR/SEC: II B.TECH. – II SEM. ACADEMIC YEAR: 2017-18

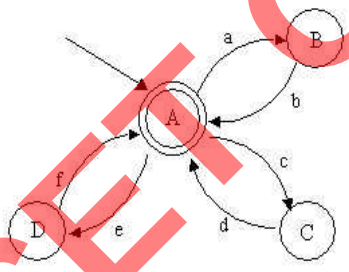
UNIT-1

1. Conclude what type of strings will be accepted by the below Finite automata as shown in figure



2. (a) Design a DFA, M that accepts the language. L(M) = {w/w ε{a,b} * } and w does not contain 3 consecutive b's
   (b) Design DFA to accept strings with c and d such that number d's are divisible by 4
   (c) Design DFA which accepts language L ={ 0,000,00000,.....} over {0}.

3. Out of the following languages, which are/is accepted by given FA and explain as shown in figure 1.



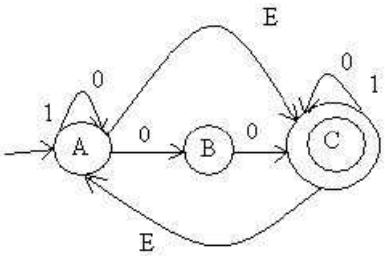
   (a) (a+b)* (c+d)* (ef)* (b) (ab)* (cd)* (ef)*
   (c) (a+b)*+(c+d)*+(ef)* (d) ((ab)*+ (cd)*+ (ef)*) *.

4. Construct NFAs for the following languages
   (a) The set of strings over alphabet {0,1,.....,9} such that the final digit has appeared before.
   (b) The set of strings over alphabet {0,1,.....,9} such that the final digit has not appeared before.
   (c) The set of strings of 0's and 1's such that there are two 0's separated by a number of positions that is a multiple of 4. Note that 0 is an allowable multiple of 4.

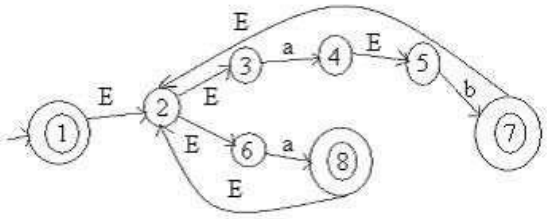
5. Construct DFA for the following:
   (a) L={w/w has both an even number of 0's and even number of 1's }
   (b) L= { w/w is in the form of 'x01y' for some strings x and y consisting of 0's And 1's}.

6. 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.

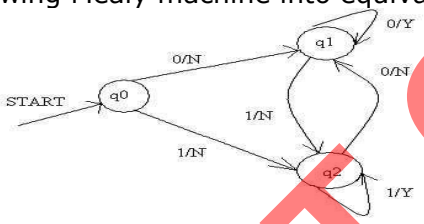
7. a)Construct DFA for given (figure 2) NFA with ε-moves.



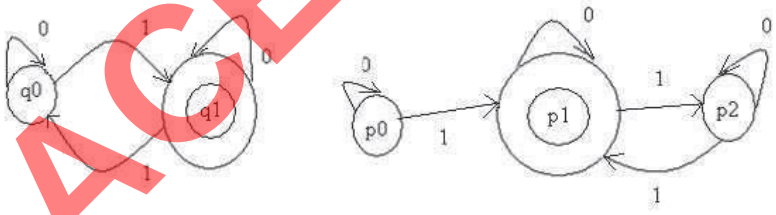
b)For the following NFA with ε -moves convert it in to an NFA with out ε -moves and show that NFA with ε -moves accepts the same language as shown in figure



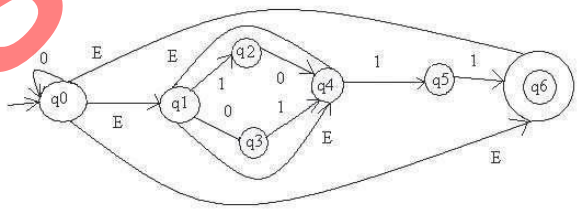
8. (a) Design a Moore machine to determine the residue mod 5 for each ternary string (base 3) treated as ternary integer.
(b) Convert the following Mealy machine into equivalent Moore machine as shown in figure



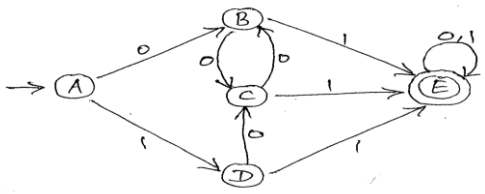
9. (a) Show that the FA are equivalent as shown in figure



(b) Construct DFA for given FA as shown in figure 2b. [8+8]



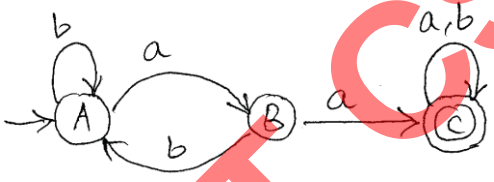
10. (a) Construct a minimal state finite automaton to the following state diagram:



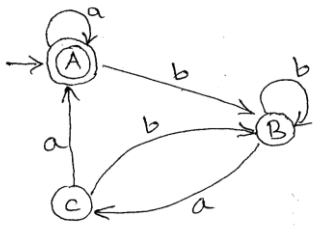
(b) Design a Moore machine and Mealy machine that accepts strings over $ = {0, 1} where, if the input ends in 001, output a A; if the input ends in 100 , output a B; else output a C.

UNIT-II

1. Find a Regular expression corresponding to each of the following subsets over {0,1}*.
   (a) The set of all strings containing no three consecutive 0's.
   (b) The set of all strings where the 10th symbol from right end is a 1.
   (c) The set of all strings over {0,1} having even number of 0's & odd no. of 1's.
   (d) The set of all strings over {0,1} in which the number of occurrences of is divisible by 3.
2. Construct an NFA for the following:
   (a) R=01[((10)*+111)*+0]*1
   (b) ((01+10)*00)*
3. Construct a DFA accepting language represented by 0*1*2*.
4. Is FA is possible for the following language L = {$a^n b^n$ |n >= 1 } if not why? Explain?
5. (a) When are two regular expressions said to be equivalent? Explain.
   (b) Find the regular expression for the following finite automaton:

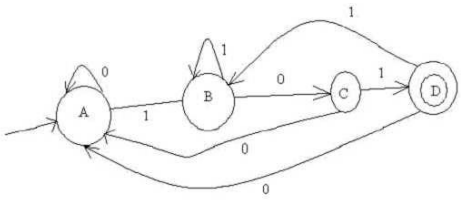


6. Construct finite automation to accept the regular expression (0+1*) (00+11) (0+1)*.
7. Construct the NFA for the regular expression,
   r = 0*1((0+1) 0*1)* (E+(0+1)(00)*)+0(00)*.
8. Give a DFA for accepting = {$a^n b^n$ / abs(n -m) mod 3 <=1} show that L is non-regular.
9. Construct an NFA and DFA for the regular expression: (0 + 1)*(00 + 11) 110.
10. Find the regular expression for the following finite automaton:



UNIT- III

1. (a) Write a CFG for EVEN and ODD palindromes?
   (b) Obtain a right linear grammar for the following FA as shown in figure



2. Find CFG generating the following Languages
   (a) L1= {aibjck |i = j }
   (b) L2= {anbm |n ≠ m }
   (c) L3= {0i1j0k |j > i + k }.
3. Consider the following context free grammar:

$$E \rightarrow I \mid E+E \mid E*E \mid (E)$$

$$I \rightarrow a \mid b \mid Ia \mid Ib \mid I0 \mid I1$$

   Find the leftmost derivation, rightmost derivation, and parse tree for the string: a*(a+b00).
4. (a) Construct a context free grammar for generating the balanced parentheses, like ( ),[ ], [( ) ( )], ([ ]), etc. and find the moves of the grammar to derive the string: ([( )] ( ))
   (b) Draw the parse tree for the production grammar: S □ (S) |SↄS |~S |i |j, Generating the symbolic formula: (~ ~ i ↄ (i ↄ ~ ~ j)).
5. Explain Chomsky hierarchy.
6. Prove that the following language is not context-free language
   L = {www |wε{a, b}*} is not context free.
7. Simplify the following grammar:
   S -> AB
   A ->a
   B ->C
   B -> b
   C -> D
   D ->E.
8. (a) What do you mean by ambiguity? Show that the grammar S -> S/S, S -> a is ambiguous.
   (b) Show that the grammar G with production
   S -> a/aAb/abSb A->aAAb/bS is ambiguous.
9. Convert the following grammar into CNF.
   S->aAD A->aB/bAB B->b D->d.
10. Convert the following grammar to GNF:
    G = ({A1,A2,A3}, {a, b}, P1, A1) Where P consists of the following:
    A1 ->A2A3 A2 -> A3A1/b A3 -> A1A2/a.

UNIT- IV

1. Construct a PDA that accepts the language
   L = {wcw^R/w ϵ {a, b}*}.
2. Let G be the grammar given by
   S -> aABB/aAA A -> aBB/a B -> bBB/A
   Construct the PDA that accepts the language generated by this grammar G.
3. Prove that acceptance by empty stack and by final state is equivalent.
4. (a) Construct the context free grammar G which accepts the PDA A by empty stack, where A=({q0, q1}, {a, b}, {Z0,Z}, δ, q0,Z0, φ)
   δ is given by
   δ(q0, b,Z0) = {(q0,ZZ0)}, δ(q0,^,Z0) = {(q0, L)}
   δ(q0, b,Z) = {(q0,ZZ)}, δ(q0, a,Z) = {(q1,Z)}
   δ(q1, b,Z) = {(q1,^)}, δ(q1, a,Z0) = {(q0,Z0)}
   (b) What is the ID of the PDA on the string 'bbaa'.
5. Define Deterministic pushdown automata. Explain with an example.
6. Find the PDA with only one state that accepts the language {a^{m}b^n : n > m }.
7. Construct the PDA that recognizes the languages L={x=x^R: x ϵ {a,b}$^+$}.
8. Define a PDA. Design a PDA for L {xcx^r / x ϵ {a,b}*}process the string "abbacabba".
   Note: x^r stands for reverse of the string x.
9. What do you mean by an instantaneous description of a PDA. Explain with example.
10. (a) when do we say that PDA is nondeterministic? Design a PDA for recognizing the language of palindromes over the input alphabet {a,b}.
    (b) Distinguish between a DPDA and NPDA.

UNIT- V

1. Define a Turing machine mathematically. Define the term 'move' in a TM.
2. Design a TM that recognizes the set {0^{n}1^n >=|n = 1 }
3. Design a Turing Machine that accepts the set of all even palindromes over{0,1}.
4. Give a Turing machine for the following:
   (a) That computes ones complement of a binary number
   (b) That shifts the input string, over the alphabet (0,1) by one position right by inserting '#'as the first character.
5. Explain briefly about the different types of Turing Machines.
6. Design a Turing Machine (TM) that accepts the language, L = { 0n1n0n| n >=1 }
7. Consider the following transition table (States versus Tape symbols) of a Turing Machine, M:

	0	1	B
→q_1	$q_1, 0, R$	-	$q_2, 1, L$
q_2	$q_2, 0, L$	$q_2, 1, L$	q_3, B, R
q_3	q_4, B, R	q_5, B, R	-
q_4	$q_4, 0, R$	$q_4, 1, R$	$q_5, 0, R$
q_5	-	-	$q_2, 0, L$

Find the computation sequence of the input string: 00B

8. What is instantaneous description of a TM? Briefly explain.
9. Given Σ= {0,1}, design a Turing machine that accepts the language denoted by the regular expressions 00*.
10. Briefly explain the properties of recursive enumerable languages.

UNIT- VI

1. Write a short notes on Decidability.
2. What is Halting Problem of Turing Machine? Is it decidable or not? Explain?
3. Explain about Universal Turing Machine?
4. What is PCP? Find the solution to the following instance of PCP:
   W = (1, 10111, 10) and x = (111, 10, 0)?
5. Explain the Turing reducibility in detail.
6. Discuss about Rice Theorem.
7. What are P and NP class of Languages? What is NP Complete and give examples?
8. Giving relevant examples explain NP Hard and NP complete problems.
9. Explain in detail about Modified Post's Correspondence Problem with an example?
10. Find whether the lists
    M = (abb, aa, aaa) and N = (bba, aaa, aa) have a Post Correspondence Solution?

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