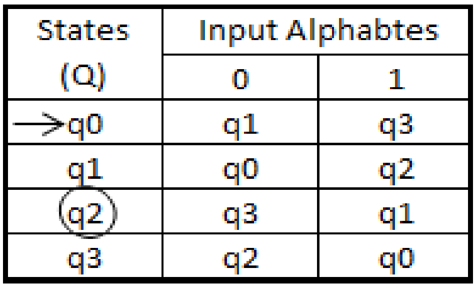
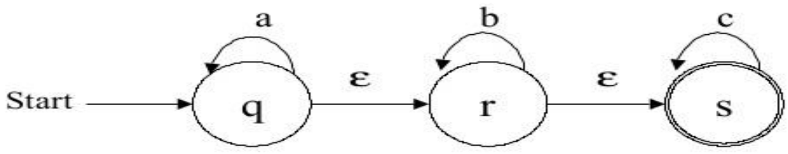
SIDDHARTH GROUP OF INSTITUTIONS :: PUTTUR
Siddharth Nagar, Narayanavanam Road – 517583

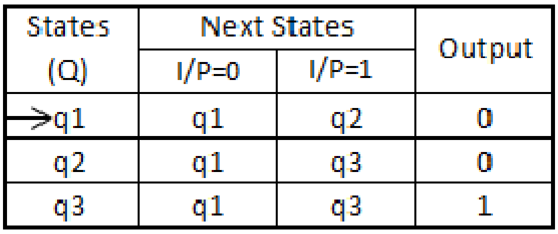
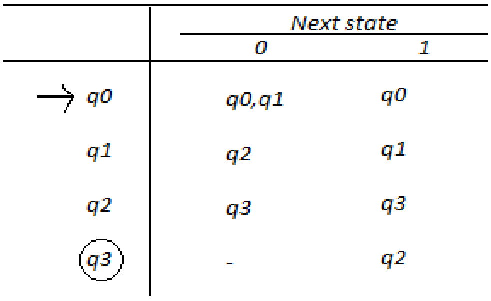
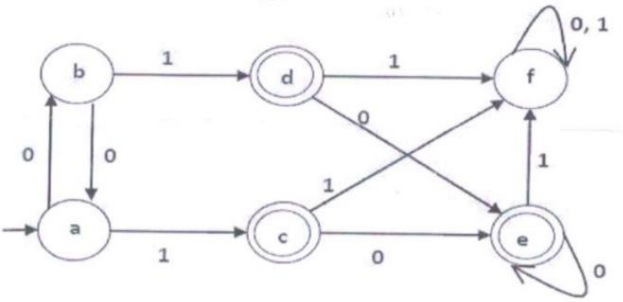
QUESTION BANK (DESCRIPTIVE)

Subject with Code: FLAT(19CS0509) **Course & Branch**: B.Tech - CSE

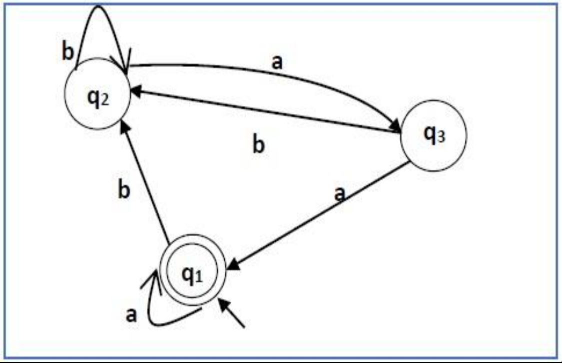
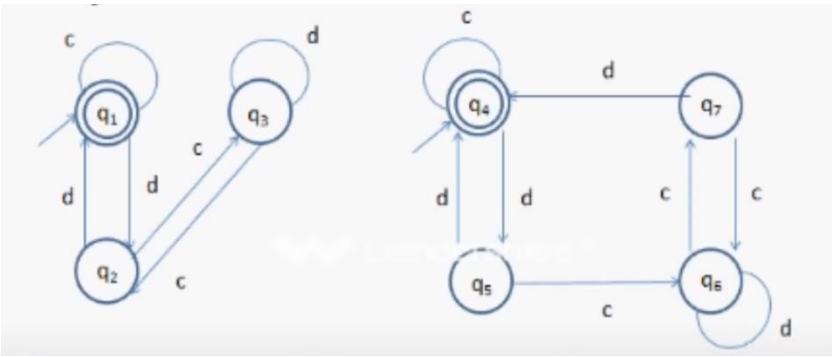
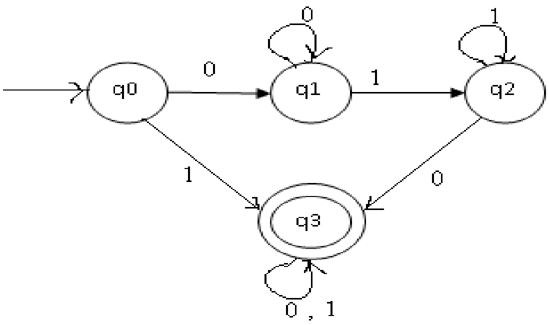
Year &Sem: II-B.Tech & II-Sem **Regulation:** R19

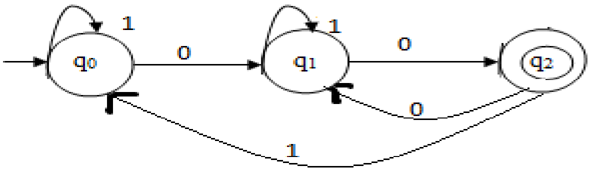
UNIT –I
INTRODUCTION

<table>
<tr><td>1</td><td>a</td><td>Consider the below finite automata and check whether the strings are accepted or not
<table><tr><td rowspan="2">States (Q)</td><td colspan="2">Input Alphabtes</td></tr><tr><td>0</td><td>1</td></tr><tr><td>→q0</td><td>q1</td><td>q3</td></tr><tr><td>q1</td><td>q0</td><td>q2</td></tr><tr><td>q2</td><td>q3</td><td>q1</td></tr><tr><td>q3</td><td>q2</td><td>q0</td></tr></table>(i) 0001 (ii) 1010 (iii) 1001 (iv)0101</td><td>[L1][CO1]</td><td>[8M]</td></tr>
<tr><td></td><td>b</td><td>Compare DFA and NFA</td><td>[L2][CO1]</td><td>[4M]</td></tr>
<tr><td>2</td><td>a</td><td>Define Grammar. Construct the Grammar for the language a^nb^n, n>0</td><td>[L3][CO1]</td><td>[4M]</td></tr>
<tr><td></td><td>b</td><td>Define Language. Construct a language generated from the given G
S → aSb / ε</td><td>[L3][CO1]</td><td>[4M]</td></tr>
<tr><td></td><td>c</td><td>Design DFA which accepts even number of 0's and odd number of 0's over {0, 1}.</td><td>[L6][CO1]</td><td>[4M]</td></tr>
<tr><td>3</td><td></td><td>Convert the following NFA with ε moves to DFA without ε moves by ε-closure method.
 </td><td>[L3][CO1]</td><td>[12M]</td></tr>
<tr><td>4</td><td>a</td><td>Contrast Mealy machine and Moore machine.</td><td>[L4][CO1]</td><td>[4M]</td></tr>
<tr><td></td><td>b</td><td>Convert the following Mealy machine into its equivalent Moore machine.
<table><tr><td rowspan="2">Present State</td><td colspan="2">I/P=0</td><td colspan="2">I/P=1</td></tr><tr><td>Next State</td><td>O/P</td><td>Next State</td><td>O/P</td></tr><tr><td>→A</td><td>C</td><td>0</td><td>B</td><td>0</td></tr><tr><td>B</td><td>A</td><td>1</td><td>D</td><td>0</td></tr><tr><td>C</td><td>B</td><td>1</td><td>A</td><td>1</td></tr><tr><td>D</td><td>D</td><td>1</td><td>C</td><td>0</td></tr></table></td><td>[L3][CO1]</td><td>[6M]</td></tr>
</table>

<table>
<tr><td></td><td>c</td><td>Construct Mealy machine corresponding to Moore machine?

<table>
<tr><th>States
(Q)</th><th colspan="2">Next States</th><th>Output</th></tr>
<tr><th></th><th>I/P=0</th><th>I/P=1</th><th></th></tr>
<tr><td>→q1</td><td>q1</td><td>q2</td><td>0</td></tr>
<tr><td>q2</td><td>q1</td><td>q3</td><td>0</td></tr>
<tr><td>q3</td><td>q1</td><td>q3</td><td>1</td></tr>
</table></td><td>[L3][CO1]</td><td>[2M]</td></tr>
<tr><td>5</td><td>a</td><td>Analyze and explain with example Chomsky Hierarchy.</td><td>[L4][CO1]</td><td>[6M]</td></tr>
<tr><td></td><td>b</td><td>Design DFA which accepts language L = {100, 101}</td><td>[L6][CO1]</td><td>[6M]</td></tr>
<tr><td>6</td><td>a</td><td>State what is meant by finite automata and discuss the Applications and Limitations FA.</td><td>[L3][CO1]</td><td>[6M]</td></tr>
<tr><td></td><td>b</td><td>Construct DFA for the given NFA

<table>
<tr><th></th><th colspan="2">Next state</th></tr>
<tr><th></th><th>0</th><th>1</th></tr>
<tr><td>→ q0</td><td>q0,q1</td><td>q0</td></tr>
<tr><td>q1</td><td>q2</td><td>q1</td></tr>
<tr><td>q2</td><td>q3</td><td>q3</td></tr>
<tr><td>q3</td><td>-</td><td>q2</td></tr>
</table></td><td>[L6][CO1]</td><td>[6M]</td></tr>
<tr><td>7</td><td>a</td><td>Write why minimization of finite automata is required and explain the procedure adapted for minimization of finite automata in Table filling method.</td><td>[L5][CO1]</td><td>[4M]</td></tr>
<tr><td></td><td>b</td><td>Minimize the following automata

</td><td>[L3][CO1]</td><td>[8M]</td></tr>
<tr><td>8</td><td>a</td><td>Describe Finite Automata with Output.</td><td>[L2][CO1]</td><td>[6M]</td></tr>
<tr><td></td><td>b</td><td>Design a Moore machine which determines the residue mod-3 for each binary string treated as binary integer.</td><td>[L6][CO1]</td><td>[6M]</td></tr>
<tr><td>9</td><td>a</td><td>Define relations on sets and explain its properties with an example.</td><td>[L1][CO1]</td><td>[6M]</td></tr>
<tr><td></td><td>b</td><td>Differences between DFA and NFA with examples.</td><td>[L4][CO1]</td><td>[6M]</td></tr>
<tr><td>10</td><td></td><td>Write down procedure for minimizing automata using Myhill- Nerode theorem with a given example. (‘*’ means final states)
<table>
<tr><th>Present State</th><th colspan="2">Next State</th></tr>
<tr><th></th><th>I/P=a</th><th>I/P=b</th></tr>
<tr><td>→ A</td><td>B</td><td>F</td></tr>
<tr><td>B</td><td>A</td><td>F</td></tr>
<tr><td>C</td><td>G</td><td>A</td></tr>
<tr><td>D</td><td>H</td><td>B</td></tr>
<tr><td>E</td><td>A</td><td>G</td></tr>
<tr><td>*F</td><td>H</td><td>C</td></tr>
<tr><td>*G</td><td>A</td><td>D</td></tr>
<tr><td>*H</td><td>A</td><td>C</td></tr>
</table></td><td>[L3][CO1]</td><td>[12M]</td></tr>
</table>

UNIT –II
REGULAR LANGUAGES

1	a	List out the identities of Regular expression.	[L1][CO2]	[6M]
	b	From the identities of RE, prove that i) 10+(1010)*[^+(1010)*]=10+(1010)* ii) (1+100*)+(1+100*)(0+10*)(0+10*)=10*(0+10*)*	[L3][CO2]	[6M]
2	a	Construct an equivalent FA for the given regular expression (0+1)*(00+11)(0+1)*	[L3][CO2]	[12M]
	b	State Arden's theorem and construct the regular expression for the following FA using Arden's theorem. 	[L3][CO2]	[12M]
3	a	Convert the given RG to FA S → aA/bB/a/b A→ aS/bB/b B→ aA/bS	[L3][CO2]	[6M]
	b	Construct an equivalent FA for the given regular expression 10 + (0 + 11) 0* 1	[L6][CO2]	[6M]
4		Write the process of equivalence two FA's? Compare the equivalence two FA's or not. 	[L4][CO2]	[12M]
5	a	Prove R=Q+RP has unique solution, R=QP*	[L3][CO2]	[4M]
	b	Construct RE from given FA by using Arden's Theorem. 	[L6][CO2]	[8M]

6		Explain about Arden’s theorem, for constructing the RE from a FA with an example.  	[L6][CO2]	[12M]
7	a	Give the Closure properties of Regular Sets	[L1][CO2]	[6M]
	b	Explain how equivalence between two FA is verified with example.	[L2][CO2]	[6M]
8	a	Define Regular expressions. List its Applications.	[L1][CO2]	[4M]
	b	Compare and Prove that the following regular expressions are equivalent. $L1 = 1^*(011)^*(1^*(011)^*)^*$ $L2 = (1+011)^*$	[L4][CO2]	[8M]
9	a	State Pumping lemma for regular languages .	[L1][CO2]	[4M]
	b	Prove that $L = \{a^ib^i \mid i \geq 0\}$ is not regular	[L3][CO2]	[8M]
10	a	Prove that the language $L= \{a^nb^n \mid n>=1\}$is not regular using pumping lemma.	[L3][CO2]	[8M]
	b	What are the applications of Pumping Lemma?	[L1][CO2]	[4M]

UNIT –III
CONTEXT FREE GRAMMAR

1	a	State what is meant by derivation and parse tree with examples.	[L1][CO3]	[4M]
	b	Construct Leftmost and Rightmost derivation and derivation tree for the string 0100110 S→0S/1AA A→0/1A/0B B→1/0BB	[L6][CO3]	[8M]
2	a	Define Ambiguous grammar with an examples.	[L1][CO3]	[4M]
	b	Remove Left recursion from the grammar S→Sab/T T→Tcd/F F→Fa/G	[L3][CO3]	[8M]
3	a	Explain Left recursion and Left factoring.	[L2][CO3]	[6M]
	b	Perform left factor for the grammar A→abB/aB/cdg/cdeB/cdfB	[L3][CO3]	[6M]
4	a	Describe what is meant by Simplifying the Grammar.	[L2][CO3]	[4M]
	b	Evaluate simplification of the grammar for the following context free grammar. S→ Aa /B B→ a/bc C→ a / ϵ	[L5][CO3]	[8M]
5	a	Write the process adapted to convert the grammar into CNF?	[L2][CO3]	[4M]
	b	Convert the following grammar into CNF. S→ bA/aB A→bAA/aS/a B→aBB/bS/a.	[L3][CO3]	[8M]
6	a	Define Greibach Normal Form.	[L1][CO3]	[2M]
	b	Convert the following grammar into Greibach Normal Form. S→AA/a A→SS/b	[L3][CO3]	[10M]
7	a	Define the following terms: i) Useless symbol ii) Null production iii) Unit productions	[L1][CO3]	[8M]
	b	List the closure properties of CFLs	[L1][CO3]	[4M]
8		Interpret simplification of the given grammar. Simplify the following CFG S→ aSb S→A A→cAd A→cd	[L5][CO3]	[12M]
9	a	Remove the unit production from the grammar S→AB A→E B→C C→D D→b E→a	[L3][CO3]	[6M]
	b	Remove ϵ productons from the grammar S→ABaC A→BC B→b/ ϵ C→D/ϵ D→d	[L3][CO3]	[6M]
10	a	State Pumping lemma for Context-free language	[L1][CO3]	[4M]
	b	Show that L = {$a^n b^n c^n$, where n>=1} is not context free.	[L3][CO3]	[8M]

UNIT –IV
PUSH DOWN AUTOMATA

1	a	A PDA is more powerful than a finite automaton. Justify this statement.	[L6][CO4]	[4M]
	b	Construct a PDA which recognizes all strings that contain equal number of 0’s and 1’s.	[L6][CO4]	[8M]
2	a	Define Instantaneous description (ID) in PDA.	[L1][CO4]	[6M]
	b	Define push down automata? Explain acceptance of PDA with final state.	[L2][CO4]	[6M]
3	a	Explain about the graphical notation of PDA.	[L5][CO4]	[6M]
	b	Explain acceptance of PDA with empty stack.	[L5][CO4]	[6M]
4	a	Construct an equivalent PDA for the following CFG. S→aAB | bBA A→bS|a B→aS | b.	[L6][CO4]	[6M]
	b	Describe acceptance of PDA.	[L6][CO4]	[6M]
5		Construct a PDA to accept the language $L = \{a^n b^{2n}, n >= 1\}$ by empty stack and final state.	[L6][CO4]	[12M]
6	a	State Push Down Automata.	[L1][CO4]	[2M]
	b	Construct a NPDA to accept the language $L=\{WW^R / W \in (a,b)^* \}$by empty stack and final state.	[L6][CO4]	[10M]
7		Construct PDA from the following Grammar. (i) S→ aB B→ bA/b A→ aB (ii) S→ 0BB B→ 0S /1S/0		[6+6M]
8		Construct a DPDA to accept the language $L=\{WCW^R / W \in (a,b)^+ \}$by empty stack and final state.	[L6][CO4]	[12M]
9		Write the process adapted and convert the given PDA into an equivalent CFG. $\delta (q_0,a_0,z_0)\rightarrow(q_1,z_1z_0)$ $\delta(q_0,b,z_0)\rightarrow(q_1,z_2z_0)$ $\delta(q_1,a,z_1)\rightarrow(q_1, z_1z_1)$ $\delta(q_1,b,z_1)\rightarrow(q_1, \lambda)$ $\delta(q_1,b,z_2)\rightarrow(q_1,z_2z_2)$ $\delta(q_1,a,z_2)\rightarrow(q_1, \lambda)$ $\delta(q_1, \lambda,z_2)\rightarrow(q_1, \lambda)$ // accepted by the empty stack.	[L3][CO4]	[12M]
10		Construct a PDA that recognizes balanced parentheses.	[L6][CO4]	[12M]

Course Code: 19CS0509

R19

UNIT –V
TURING MACHINES AND UNDECIDABILITY

<table>
<tr><td rowspan="2">1</td><td>a</td><td>Describe Instantaneous Description of Turing Machine.</td><td>[L2][CO5]</td><td>[6M]</td></tr>
<tr><td>b</td><td>Explain about the graphical notation of TM.</td><td>[L3][CO5]</td><td>[6M]</td></tr>
<tr><td>2</td><td></td><td>Construct a Turing machine which multiplies two unary numbers.</td><td>[L6][CO5]</td><td>[12M]</td></tr>
<tr><td rowspan="2">3</td><td>a</td><td>Explain the procedure adapted to convert RE to TM.</td><td>[L21][CO5]</td><td>[6M]</td></tr>
<tr><td>b</td><td>Convert the given regular Expression (a+b)*(aa+bb)(a+b)* to TM</td><td>[L3][CO5]</td><td>[6M]</td></tr>
<tr><td>4</td><td></td><td>Construct a Turing machine that recognizes the language L={a^n b^n, n>1}. Show an ID for the string ‘aaabbb’ with tape symbols.</td><td>[L6][CO5]</td><td>[12M]</td></tr>
<tr><td>5</td><td></td><td>Explain the various types of Turing machine.</td><td>[L2][CO5]</td><td>[12M]</td></tr>
<tr><td>6</td><td></td><td>Design a Turing Machine to accept the set of all palindrome over {0,1}*. Draw the transition diagram for the same.</td><td>[L6][CO5]</td><td>[12M]</td></tr>
<tr><td>7</td><td>a</td><td>Discriminate Universal Turing machine.</td><td>[L5][CO5]</td><td>[6M]</td></tr>
<tr><td></td><td>b</td><td>Illustrate Linear Bounded Automta</td><td>[L2][CO6]</td><td>[6M]</td></tr>
<tr><td>8</td><td>a</td><td>Differentiate PCP and MPCP.</td><td>[L4][CO6]</td><td>[6M]</td></tr>
<tr><td></td><td>b</td><td>Find the PCP solution for the following sets.
<table>
<tr><th>A</th><th>B</th></tr>
<tr><td>10</td><td>101</td></tr>
<tr><td>01</td><td>100</td></tr>
<tr><td>0</td><td>10</td></tr>
<tr><td>100</td><td>0</td></tr>
<tr><td>1</td><td>010</td></tr>
</table></td><td>[L5][CO6]</td><td>[6M]</td></tr>
<tr><td rowspan="2">9</td><td>a</td><td>Define PCP. Verify whether the following lists have a PCP solution.
$\begin{pmatrix}abab\\ababaaa\end{pmatrix}, \begin{pmatrix}aaabbb\\bb\end{pmatrix}, \begin{pmatrix}aab\\baab\end{pmatrix}, \begin{pmatrix}ba\\baa\end{pmatrix}, \begin{pmatrix}ab\\ba\end{pmatrix}, \begin{pmatrix}aa\\a\end{pmatrix}.$</td><td>[L5][CO6]</td><td>[6M]</td></tr>
<tr><td>b</td><td>Illustrate Linear Bounded Automata</td><td>[L2][CO6]</td><td>[6M]</td></tr>
<tr><td>10</td><td></td><td>Define Mathematical Definition of Turing Machine. Describe Recursive and Recursively Enumerable Languages.</td><td>[L2][CO6]</td><td>[12M]</td></tr>
</table>

Prepared by:
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