Course Code: **20CS0512** **R20**

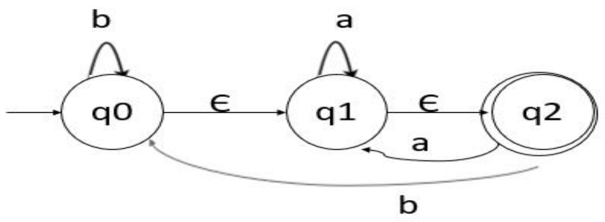
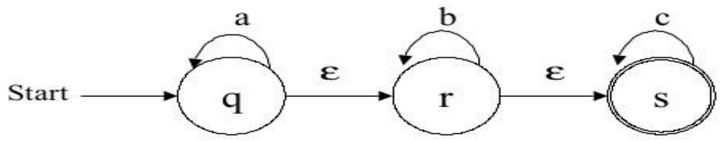
SIDDARTHA INSTITUTE OF SCIENC AND TECHNOLOGY:PUTTUR
(AUTONOMOUS)

QUESTION BANK (DESCRIPTIVE)

Subject with Code: FLAT(20CS0512) **Course & Branch**: B.Tech - CSE

Year &Sem: II-B.Tech & II-Sem **Regulation:** R20

UNIT –I
INTRODUCTION

<table>
<tr><td>1</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>2</td><td>a</td><td>Consider the below finite automata and check whether the strings are accepted or not
<table>
<tr><th>States (Q)</th><th colspan="2">Input Alphabtes</th></tr>
<tr><th></th><th>0</th><th>1</th></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>3</td><td>a</td><td>Define Melay machine and Moore machine.</td><td>[L3][CO1]</td><td>[4M]</td></tr>
<tr><td></td><td>b</td><td>Define alphabets, strings, Languages?</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][CO2]</td><td>[4M]</td></tr>
<tr><td>4</td><td>a</td><td>Analyze and explain with example Chomsky Hierarchy.</td><td>[L4][CO1]</td><td>[4M]</td></tr>
<tr><td></td><td>b</td><td>Convert the following NFA with ε moves to DFA.

</td><td>[L6][CO2]</td><td>[8M]</td></tr>
<tr><td>5</td><td></td><td>Convert the following NFA with ε moves to NFA without ε moves by ε-closure method.

</td><td>[L3][CO2]</td><td>[12M]</td></tr>
<tr><td>6</td><td>a</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][CO2]</td><td>[6M]</td></tr>
</table>

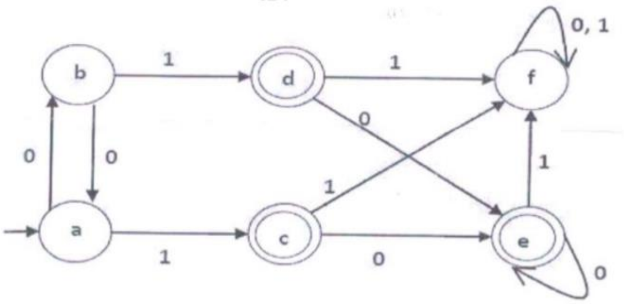
	b	State what is meant by finite automata and discuss the Applications and Limitations FA.	[L3][CO1]	[6M]
7	a	Difference between Mealy machine and Moore machine.	[L4][CO1]	[4M]
	b	Convert the following Mealy machine into its equivalent Moore machine.	[L3][CO2]	[6M]

Present State	I/P=0		I/P=1	
	Next State	O/P	Next State	O/P
→A	C	0	B	0
B	A	1	D	0
C	B	1	A	1
D	D	1	C	0

	c	Construct Mealy machine corresponding to Moore machine?	[L3][CO2]	[2M]

States (Q)	Next States		Output
	I/P=0	I/P=1	
→q1	q1	q2	0
q2	q1	q3	0
q3	q1	q3	1

8	a	Describe Finite Automata with Output.	[L2][CO1]	[6M]
	b	Write why minimization of finite automata is required and explain the procedure adapted for minimization of finite automata in Table filling method.	[L6][CO1]	[6M]
9		Minimize the following automata	[L3][CO2]	[12M]



10		Write down procedure for minimizing automata using Myhill- Nerode theorem with a given example. ('*' means final states)	[L3][CO2]	[12M]

Present State	Next State	
	I/P=a	I/P=b
→ A	B	F
B	A	F
C	G	A
D	H	B
E	A	G
*F	H	C
*G	A	D
*H	A	C

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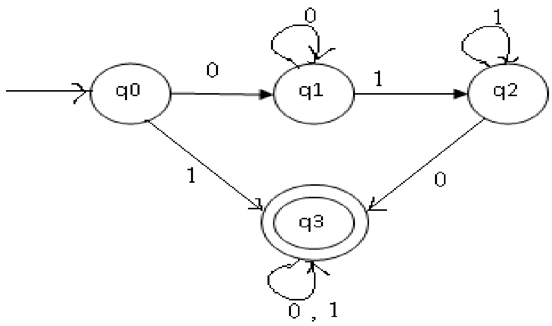
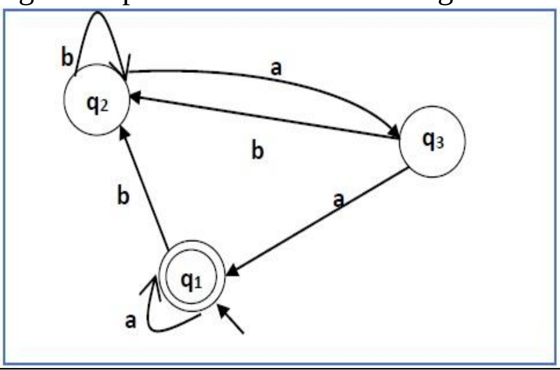
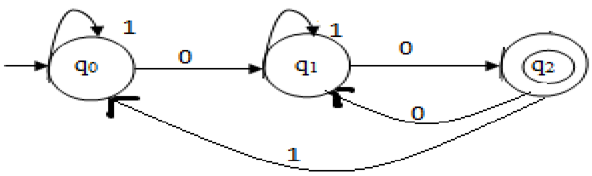
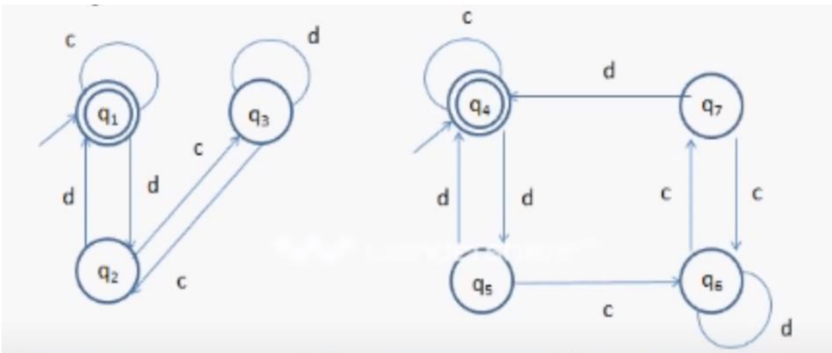
UNIT –II
REGULAR LANGUAGES

1	a	List out the identities of Regular expression.	[L1][CO3]	[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][CO3]	[6M]
2	a	Prove R=Q+RP has unique solution, R=QP*	[L3][CO3]	[4M]
	b	Construct RE from given FA by using Arden's Theorem. 	[L6][CO3]	[8M]
3	a	Construct the regular expression for the following FA. 	[L6][CO3]	[6M]
	b	Construct an equivalent FA for the given regular expression (0+1)*(00+11)(0+1)*	[L3][CO2]	[6M]
4		Explain about Arden's theorem, for constructing the RE from a FA with an example. 	[L6][CO3]	[12M]
5		Write the process of equivalence two FA's? Compare the equivalence two FA's or not. 	[L4][CO3]	[12M]
6	a	Define Regular expressions. List its Applications.	[L1][CO3]	[4M]
	b	Compare and Prove that the following regular expressions are equivalent. L1 = 1*(011)*(1*(011)*)*L2 = (1+011)*	[L4][CO3]	[8M]

7	a	Convert the given RG to FA S →aA/bB/a/b A→aS/bB/b B→aA/bS	[L3][CO3]	[6M]
	b	Construct an equivalent FA for the given regular expression 10 + (0 + 11)0* 1	[L6][CO2]	[6M]
8	a	State Pumping lemma for regular languages .	[L1][CO3]	[4M]
	b	Prove that L = $\{a^ib^i \mid i \geq 0\}$ is not regular	[L3][CO3]	[8M]
9	a	Prove that the language L= $\{a^nb^n \mid n>=1\}$is not regular using pumping lemma.	[L3][CO3]	[8M]
	b	What are the applications of Pumping Lemma?	[L1][CO3]	[4M]
10	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]

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UNIT –III
CONTEXT FREE GRAMMAR

1	a	State what is meant by derivation and parse tree with examples.	[L1][CO4]	[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][CO4]	[8M]
2	a	Define Ambiguous grammar with an examples.	[L1][CO4]	[4M]
	b	Remove Left recursion from the grammar S→Sab/T T→Tcd/F F→Fa/G	[L3][CO4]	[8M]
3	a	Explain Left recursion and Left factoring.	[L2][CO4]	[6M]
	b	Perform left factor for the grammar A→abB/aB/cdg/cdeB/cdfB	[L3][CO4]	[6M]
4	a	Describe what is meant by Simplifying the Grammar.	[L2][CO4]	[4M]
	b	Evaluate simplification of the grammar for the following context free grammar. S→Aa /B B→ a/bc C→a / ϵ	[L5][CO4]	[8M]
5	a	Write the process adapted to convert the grammar into CNF?	[L2][CO4]	[4M]
	b	Convert the following grammar into CNF. S→bA/aB A→bAA/aS/a B→aBB/bS/a.	[L3][CO4]	[8M]
6	a	Define Greibach Normal Form.	[L1][CO4]	[2M]
	b	Convert the following grammar into Greibach Normal Form. S→AA/a A→SS/b	[L3][CO4]	[10M]
7	a	Define the following terms: i) Useless symbol ii) Null production iii) Unit productions	[L1][CO4]	[8M]
	b	List the closure properties of CFLs	[L1][CO4]	[4M]
8		Interpret simplification of the given grammar. Simplify the following CFG S→aSb S→AA→cAd A→cd	[L5][CO4]	[12M]
9	a	Remove the unit production from the grammar S→AB A→E B→CC→DD→b E→a	[L3][CO4]	[6M]
	b	Remove ϵ productons from the grammar S→ABaC A→BC B→b/ ϵ C→D/ϵ D→d	[L3][CO4]	[6M]
10	a	State Pumping lemma for Context-free language	[L1][CO4]	[4M]
	b	Show that L = {$a^n b^n c^n$,where n>=1} is not context free.	[L3][CO4]	[8M]

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UNIT –IV
PUSH DOWN AUTOMATA

1	a	State the formal of PDA.	[L1][CO5]	[4M]
	b	Construct a PDA which recognizes all strings that contain equal number of 0's and 1's.	[L6][CO5]	[8M]
2	a	Describe Instantaneous description (ID) in PDA.	[L2][CO5]	[6M]
	b	Define push down automata? Explain acceptance of PDA with final state.	[L2][CO5]	[6M]
3	a	Explain about the graphical notation of PDA.	[L5][CO5]	[6M]
	b	Explain acceptance of PDA with empty stack.	[L5][CO5]	[6M]
4	a	Construct an equivalent PDA for the following CFG. $S \rightarrow aAB \mid bBA$ $A \rightarrow bS \mid a$ $B \rightarrow aS \mid b$.	[L6][CO5]	[6M]
	b	Describe acceptance of PDA.	[L6][CO5]	[6M]
5		Construct a PDA to accept the language $L = \{a^n b^{2n}, n >= 1\}$ by empty stack and final state.	[L6][CO5]	[12M]
6		Construct PDA from the following Grammar. (i) $S \rightarrow aBB \rightarrow bA/bA \rightarrow aB$ (ii) $S \rightarrow 0BB$ $B \rightarrow 0S /1S/0$	[L6][CO5]	[6+6M]
7		Design a DPDA to accept the language $L=\{WCW^R / W \in (a,b)^+\}$by empty stack and final state.	[L6][CO5]	[12M]
8		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][CO5]	[12M]
9		Construct a PDA that recognizes balanced parentheses.	[L6][CO5]	[12M]
10	a	State NPDA.	[L1][CO5]	[2M]
	b	Construct a NPDA to accept the language $L=\{WW^R / W \in (a,b)^*\}$by empty stack and final state.	[L6][CO5]	[10M]

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UNIT –V
TURING MACHINES AND UNDECIDABILITY

<table>
<tr><td>1</td><td>a</td><td>State Turing machine.</td><td>[L1][CO6]</td><td>[2M]</td></tr>
<tr><td></td><td>b</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][CO6]</td><td>[10M]</td></tr>
<tr><td>2</td><td>a</td><td>Explain about the graphical notation of TM.</td><td>[L3][CO6]</td><td>[6M]</td></tr>
<tr><td></td><td>b</td><td>Describe Instantaneous Description of Turing Machine.</td><td>[L2][CO6]</td><td>[6M]</td></tr>
<tr><td>3</td><td></td><td>Construct a Turing machine which multiplies two unary numbers.</td><td>[L6][CO6]</td><td>[12M]</td></tr>
<tr><td>4</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][CO6]</td><td>[12M]</td></tr>
<tr><td>5</td><td>a</td><td>Explain the procedure adapted to convert RE to TM.</td><td>[L2][CO6]</td><td>[6M]</td></tr>
<tr><td></td><td>b</td><td>Convert the given regular Expression (a+b)*(aa+bb)(a+b)* to TM</td><td>[L3][CO6]</td><td>[6M]</td></tr>
<tr><td>6</td><td></td><td>Explain the various types of Turing machine.</td><td>[L2][CO6]</td><td>[12M]</td></tr>
<tr><td>7</td><td>a</td><td>Discriminate Universal Turing machine.</td><td>[L5][CO6]</td><td>[6M]</td></tr>
<tr><td></td><td>b</td><td>Constructa TM for regular Expression 01(00+11)(0+1)*1.</td><td>[L6][CO6]</td><td>[6M]</td></tr>
<tr><td>8</td><td>a</td><td>Differentiate PCP and MPCP.</td><td>[L4][CO6]</td><td>[4M]</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>[8M]</td></tr>
<tr><td>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></td><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>
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