Course Code: 20CS0512 **R20**

SIDDHARTH INSTITUTE OF ENGINEERING 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

1 a Define relations on sets and explain its properties with an example. [L1][CO1] [6M]

b Differences between DFA and NFA with examples. [L4][CO1] [6M]

2 a Consider the below finite automata and check whether the strings are accepted or not [L1][CO1] [8M]

States (Q)	Input Alphabtes 0	1
→q0	q1	q3
q1	q0	q2
(q2)	q3	q1
q3	q2	q0

(i) 0001 (ii) 1010 (iii) 1001 (iv) 0101

b Compare DFA and NFA [L2][CO1] [4M]

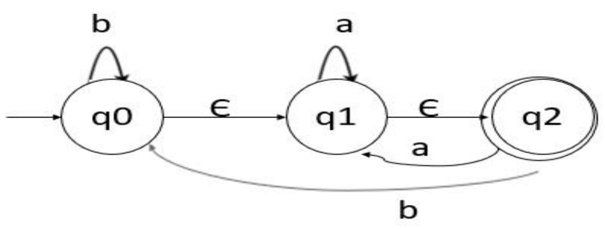
3 a Define Melay machine and Moore machine. [L3][CO1] [4M]

b Define alphabets, strings, Languages? [L3][CO1] [4M]

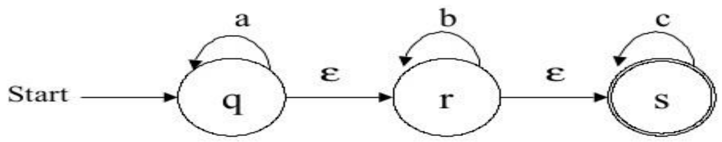
c Design DFA which accepts even number of 0's and odd number of 1's over {0, 1}. [L6][CO2] [4M]

4 a Analyze and explain with example Chomsky Hierarchy. [L4][CO1] [4M]

b Convert the following NFA with ε moves to DFA. [L6][CO2] [8M]



5 Convert the following NFA with ε moves to NFA without ε moves by ε-closure method. [L3][CO2] [12M]



6 a Construct DFA for the given NFA [L6][CO2] [6M]

	Next state 0	1
→ q0	q0,q1	q0
q1	q2	q1
q2	q3	q3
(q3)	-	q2

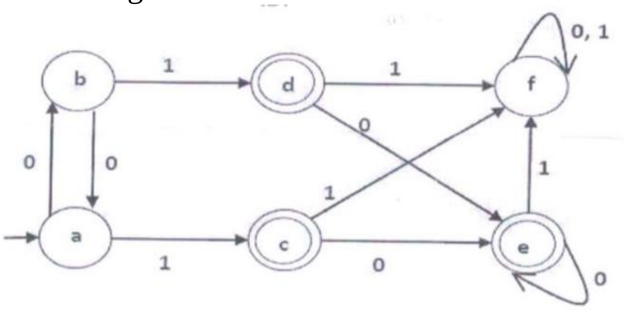
	b	State what is meant by finite automata and discuss the Applications and Limitations FA.	[L3][CO1]	[6M]
7	a	Contrast Mealy machine and Moore machine.	[L4][CO1]	[4M]
	b	Convert the following Mealy machine into its equivalent Moore machine.	[L3][CO2]	[6M]

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.	[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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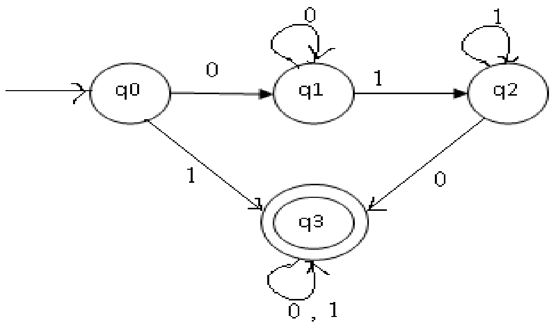
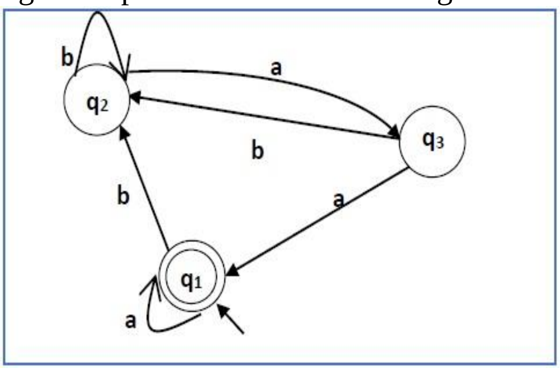
UNIT –II
REGULAR LANGUAGES

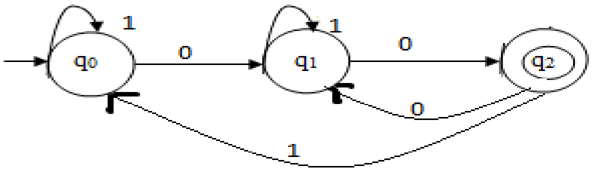
1	a	List out the identities of Regular expression.	[L1][CO3]	[6M]
	b	From the identities of RE, prove that i) 10+(1010)*[^+(1010)*]=10+(1010)* ii) (1+100*)+(1+100*)(0+10*)(0+10*)*=10*(0+10*)*	[L3][CO3]	[6M]
2	a	Prove R=Q+RP has unique solution, R=QP*	[L3][CO3]	[4M]
	b	Construct RE from given FA by using Arden's Theorem.	[L6][CO3]	[8M]



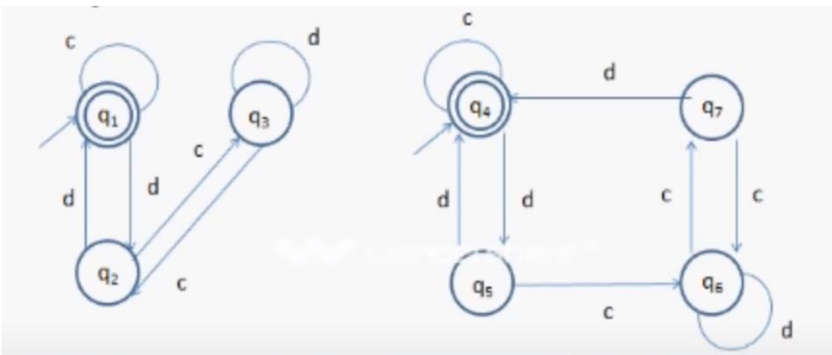
3	a	Construct the regular expression for the following FA.	[L6][CO3]	[6M]



	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	a	Construct an equivalent FA for the given regular expression 10 + (0 + 11) 0* 1	[L6][CO2]	[6M]
	b	Write the process of equivalence two FA's? Compare the equivalence two FA's or not.	[L4][CO3]	[6M]



6	a	Define Regular expressions. List its Applications.	[L1][CO3]	[4M]
	b	Compare and Prove that the following regular expressions are equivalent.	[L4][CO3]	[8M]

		L1 = 1*(011)*(1*(011)*)* L2 = (1+011)*		
7	a	Convert the given RG to FA S → aA/bB/a/b A→ aS/bB/b B→ aA/bS	[L3][CO2]	[6M]
	b	Construct a regular grammar for the given regular expression ab(a+b)*	[L6][CO1]	[6M]
8	a	State Pumping lemma for regular languages.	[L1][CO3]	[4M]
	b	Prove that L = $\{a^i b^i \mid i \geq 0\}$ is not regular	[L3][CO3]	[8M]
9	a	Prove that the language L= $\{a^n b^n \mid n>=1\}$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]

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 $S \rightarrow 0S/1AA$ $A \rightarrow 0/1A/0B$ $B \rightarrow 1/0BB$	[L6][CO4]	[8M]
2	a	Define Ambiguous grammar with an examples.	[L1][CO4]	[4M]
	b	Remove Left recursion from the grammar $S \rightarrow Sab/T$ $T \rightarrow Tcd/F$ $F \rightarrow Fa/G$	[L3][CO4]	[8M]
3	a	Explain Left recursion and Left factoring.	[L2][CO4]	[6M]
	b	Perform left factor for the grammar $A \rightarrow abB/aB/cdg/cdeB/cdfB$	[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. $S \rightarrow Aa /B$ $B \rightarrow a/bC$ $C \rightarrow a / \epsilon$	[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. $S \rightarrow bA/aB$ $A \rightarrow bAA/aS/a$ $B \rightarrow aBB/bS/a$.	[L3][CO4]	[8M]
6	a	Define Greibach Normal Form.	[L1][CO4]	[2M]
	b	Convert the following grammar into Greibach Normal Form. $S \rightarrow AA/a$ $A \rightarrow SS/b$	[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 and explain simplification of the grammar. Simplify the following CFG $S \rightarrow aSb$ $S \rightarrow A$ $A \rightarrow cAd$ $A \rightarrow cd$	[L5][CO4]	[12M]
9	a	Remove the unit production from the grammar $S \rightarrow AB$ $A \rightarrow E$ $B \rightarrow C$ $C \rightarrow D$ $D \rightarrow b$ $E \rightarrow a$	[L3][CO4]	[6M]
	b	Remove ϵ productons from the grammar $S \rightarrow ABaC$ $A \rightarrow BC$ $B \rightarrow b/ \epsilon$ $C \rightarrow D/\epsilon$ $D \rightarrow d$	[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]

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) $S \rightarrow aB$ $B \rightarrow bA/b$ $A \rightarrow aB$ (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]

UNIT –V
TURING MACHINES AND UNDECIDABILITY

1	a	State Turing machine.	[L1][CO6]	[2M]
	b	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.	[L6][CO6]	[10M]
2	a	Explain about the graphical notation of TM.	[L3][CO6]	[6M]
	b	Describe Instantaneous Description of Turing Machine.	[L2][CO6]	[6M]
3		Construct a Turing machine which multiplies two unary numbers.	[L6][CO6]	[12M]
4		Design a Turing Machine to accept the set of all palindrome over {0,1}*. Draw the transition diagram for the same.	[L6][CO6]	[12M]
5	a	Explain the procedure adapted to convert RE to TM.	[L2][CO6]	[6M]
	b	Convert the given regular Expression (a+b)*(aa+bb)(a+b)* to TM	[L3][CO6]	[6M]
6		Explain the various types of Turing machine.	[L2][CO6]	[12M]
7	a	Discriminate Universal Turing machine.	[L5][CO6]	[6M]
	b	Construct a TM for regular Expression 01(00+11)(0+1)*1.	[L6][CO6]	[6M]
8	a	Differentiate PCP and MPCP.	[L4][CO6]	[4M]
	b	Find the PCP solution for the following sets.	[L5][CO6]	[8M]

A	B
10	101
01	100
0	10
100	0
1	010

9	a	Define PCP. Verify whether the following lists have a PCP solution. $\binom{abab}{ababaaa}, \binom{aaabbb}{bb}, \binom{aab}{baab}, \binom{ba}{baa}, \binom{ab}{ba}, \binom{aa}{a}.$	[L5][CO6]	[6M]
	b	Illustrate Linear Bounded Automata	[L2][CO6]	[6M]
10		Define Mathematical Definition of Turing Machine. Describe Recursive and Recursively Enumerable Languages.	[L2][CO6]	[12M]