

CMR Technical Campus

B. Tech Mid Question Bank (R22 Regulation)

Academic Year: 2024-25

Semester: VI

Subject Name: FORMAL LANGUAGES AND AUTOMATA THEORY

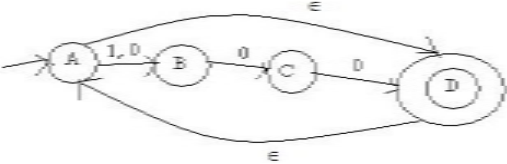
Faculty Name: DR N BHASKAR,G VINESH SHANKAR,A GANAPATHI

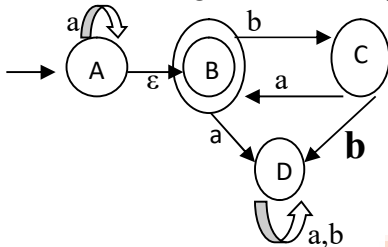
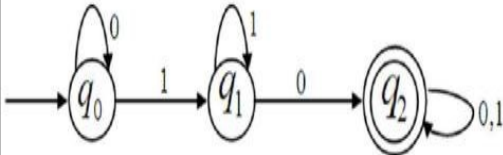
PART-A

MID-I Questions					
Q.No	Questions	Marks	BL	CO	Unit No
1	Differentiate DFA and NFA with examples.	2M	BL1	CO1	I
2	List applications of finite automata.	2M	BL1	CO1	I
3	Sketch DFA for $L = \{ w \mid w \text{ has even number of } a's \}$ where $\Sigma = \{a,b\}$	2M	BL1	CO1	I
4	Design DFA to accept strings divisible by 3 over $\Sigma = (0,1)$.	2M	BL2	CO1	I
5	Define Alphabet, String.	2M	BL2	CO1	I
6	Define transition diagram and transition table with suitable examples.	2M	BL2	CO1	I
7	Define regular expression with an example	2M	BL2	CO2	II
8	Write any five algebraic laws for regular expression.	2M	BL1	CO2	II
9	Define pumping lemma for regular languages.	2M	BL2	CO2	II
10	Construct automata for $a^*b + b^*a$.	2M	BL3	CO2	II
11	Write about Applications of regular expressions.	2M		CO2	II
12	List any Five Closure Properties.	2M	BL2	CO2	II
13	Define context free grammar with suitable examples.	2M	BL2	CO3	III
14	Derive LMD,RMD $S \rightarrow a aAb abSb$, $A \rightarrow aAAb bS$ for a string abababb.	2M	BL2	CO3	III
15	Define ambiguous grammar. Show that the following grammar is ambiguous on the string 'aab', $S \rightarrow aS aSbS \epsilon$	2M	BL3	CO3	III
MID-II Questions					
16	Short note on derivation tree with suitable examples.	2M	BL2	CO3	III
17	Explain rightmost derivation and left most derivation with an suitable examples.	2M	BL3	CO3	III
18	Define ambiguous grammar.	2M	BL2	CO3	III
19	Let G be a CFG that generates the set of palindromes given by $S \rightarrow aSa bSb a b$ Find the PDA that accepts L(G).	2M	BL2	CO4	IV

20	Define Parse Tree with suitable example.	2M	BL2	CO4	IV
21	Briefly Explain PDA with example.	2M	BL3	CO4	IV
22	Briefly Explain DPDA with example.	2M	BL2	CO4	IV
23	List applications of CFG.	2M	BL3	CO4	IV
24	Different between leftmost and Right derivation with example.	2M	BL2	CO4	IV
25	Write closure properties of CFL.	2M	BL2	CO5	V
26	Write Decision properties of CFL.	2M	BL2	CO5	V
27	Define CNF with suitable.	2M	BL3	CO5	V
28	Define GNF with suitable.	2M	BL2	CO5	V
29	Different between NP Hard and NP Complete with example.	2M	BL3	CO5	V
30	Define Turning Machine with suitable example.	2M	BL2	CO5	V

PART-B

MID-I Questions																													
Q.No	Questions	Marks	BL	CO	Unit No																								
1	Convert the following NFA to equivalent DFA <table><tr><td></td><td>0</td><td>1</td><td>€</td></tr><tr><td>--→A</td><td>B</td><td>B,D</td><td>--</td></tr><tr><td>B</td><td>--</td><td>D</td><td>E</td></tr><tr><td>C</td><td>E</td><td>--</td><td>--</td></tr><tr><td>D</td><td>B,C</td><td>--</td><td>E</td></tr><tr><td>**E</td><td>E</td><td>E</td><td>--</td></tr></table>		0	1	€	--→A	B	B,D	--	B	--	D	E	C	E	--	--	D	B,C	--	E	**E	E	E	--	4M	BL1	CO1	I
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--→A	B	B,D	--																										
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C	E	--	--																										
D	B,C	--	E																										
**E	E	E	--																										
2	Construct a NFA for the given NFA with € moves 	4M	BL2	CO1	I																								
3	Draw the transition diagram for the DFA accepting all strings with a substring 10.	4M	BL3	CO1	I																								
4	Design a NFA accept the following string over the alphabet(0,1). The set of all string that begin with 01 and end with 11. Check for the validity of 01111 and 0110 string.	4M	BL1	CO1	I																								
5	Construct an NFA accepting binary string with two consecutive 0's.	4M	BL4	CO1	I																								
6	Design DFA to accept odd number of a's and even number of b's , where Σ=(a,b). show the acceptance of a string with an example.	4M	BL1	CO1	I																								
7	Design DFA for the following over (a,b) i).All string containing not more than three a's	8M	BL2	CO1	I																								

	ii).All strings that has at least two occurrences of b between any two occurrence of a.																															
8	Explain procedure for converting NFA with ϵ moves to without ϵ with suitable example.	8M	BL2	CO1	I																											
9	Convert following NFA with epsilon to DFA. 	8M	BL6	CO1	I																											
10	State and prove Arden's theorem.	4M	BL2	CO2	II																											
11	Construct DFA with reduced states equivalent to regular expression. $10+(0+11)0^*1$	4M	BL2	CO2	II																											
12	Prove $L=\{a^n b^{2n} \mid n \geq 0\}$ is not regular language using pumping lemma.	4M	BL2	CO2	II																											
13	Construct Minimum state automata for the following. <table><tr><td></td><td>a</td><td>b</td></tr><tr><td>$\rightarrow A$</td><td>B</td><td>A</td></tr><tr><td>B</td><td>A</td><td>C</td></tr><tr><td>C</td><td>D</td><td>B</td></tr><tr><td>D (final state)</td><td>D</td><td>A</td></tr><tr><td>E</td><td>D</td><td>F</td></tr><tr><td>F</td><td>G</td><td>E</td></tr><tr><td>G</td><td>F</td><td>G</td></tr><tr><td>H</td><td>G</td><td>D</td></tr></table>		a	b	$\rightarrow A$	B	A	B	A	C	C	D	B	D (final state)	D	A	E	D	F	F	G	E	G	F	G	H	G	D	4M	BL3	CO2	II
	a	b																														
$\rightarrow A$	B	A																														
B	A	C																														
C	D	B																														
D (final state)	D	A																														
E	D	F																														
F	G	E																														
G	F	G																														
H	G	D																														
14	Write a RE for the following FA <table><tr><td></td><td>a</td><td>b</td></tr><tr><td>$\rightarrow P$</td><td>Q</td><td>P</td></tr><tr><td>Q^*</td><td>Q</td><td>P</td></tr></table>		a	b	$\rightarrow P$	Q	P	Q^*	Q	P	4M	BL2	CO2	II																		
	a	b																														
$\rightarrow P$	Q	P																														
Q^*	Q	P																														
15	Construct the regular expression corresponding to the language accepted by following DFA. 	4M	BL3	CO2	II																											
16	Minimize the given DFA	8M	BL3	CO2	II																											

17	<p>Explain about pumping Lemma Theorem and Determine whether the following language are regular or not with proper justification</p> $L=\{a^n b^n / n \geq 1\}$	8M	BL4	CO2	II																																	
18	<p>Check whether following automata are equivalent or not.</p> <p>Machine 1</p> <table border="1"> <tr> <td></td> <td>C</td> <td>D</td> </tr> <tr> <td>→ q1</td> <td>q1</td> <td>q2</td> </tr> <tr> <td>*</td> <td></td> <td></td> </tr> <tr> <td>q2</td> <td>q3</td> <td>q1</td> </tr> <tr> <td>q3</td> <td>q2</td> <td>q3</td> </tr> </table> <p>Machine 2</p> <table border="1"> <tr> <td></td> <td>C</td> <td>D</td> </tr> <tr> <td>→ q4</td> <td>q4</td> <td>q5</td> </tr> <tr> <td>*</td> <td></td> <td></td> </tr> <tr> <td>q5</td> <td>q6</td> <td>q4</td> </tr> <tr> <td>q6</td> <td>q7</td> <td>q6</td> </tr> <tr> <td>q7</td> <td>q6</td> <td>q4</td> </tr> </table>		C	D	→ q1	q1	q2	*			q2	q3	q1	q3	q2	q3		C	D	→ q4	q4	q5	*			q5	q6	q4	q6	q7	q6	q7	q6	q4	8M	BL3	CO2	II
	C	D																																				
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q2	q3	q1																																				
q3	q2	q3																																				
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*																																						
q5	q6	q4																																				
q6	q7	q6																																				
q7	q6	q4																																				
20	<p>Show that the following grammar is ambiguous</p> $E \rightarrow E + E E - E E * E E / E (E) a$ <p>where E is the start symbol.</p>	4M	BL3	CO3	III																																	
21	<p>Write CFG for the language $\{0^n 1^n / n \geq 1\}$.</p>	4M	BL3	CO3	III																																	
MID-II Questions																																						
22	<p>Explain rightmost derivation and left most derivation with an suitable examples.</p>	4M	BL2	CO3	III																																	

23	Show that the following grammar is ambiguous: $S \rightarrow SbS/a$	4M	BL3	CO3	III
24	Construct the CFG representing the set of palindrome over $(0+1)^*$.	4M	BL3	CO3	III
25	Explain about pumping lemma algorithm	4M	BL3	CO4	IV
26	Write about closure properties of context free language	4M	BL3	CO4	IV
27	Enumerate normal forms for context free language	4M	BL2	CO4	IV
28	Convert the following context free language to CNF $S \rightarrow ABC$ $A \rightarrow Aa/\epsilon$ $B \rightarrow bB/\epsilon$ $C \rightarrow cC/\epsilon$	4M	BL3	CO4	IV
29	Convert the following CFG into GNF. $S \rightarrow AB$ $A \rightarrow a$ $B \rightarrow CA$ $C \rightarrow AB/b$	4M	BL3	CO4	IV
30	Construct a PDA for accepting a language $\{L = a^n b^n \mid n \geq 1\}$	4M	BL2	CO4	IV
31	Construct PDA for the given CFG $S \rightarrow 0BB$ $B \rightarrow 0S \mid 1S \mid 0$ Test whether 01044 is accepted by this PDA	8M	BL3	CO4	IV
32	Convert the following CFG into Chomsky's Normal Form (CNF) $S \rightarrow ABA \mid BaA \mid A$ $A \rightarrow Ba \mid S \mid \epsilon$ $B \rightarrow Ba \mid b \mid Ca$ $C \rightarrow Ca$ $D \rightarrow DaD \mid a$	8M	BL3	CO4	IV
33	Different between PDA and DPDA with suitable	8M	BL2	CO4	IV

	examples				
34	Different between Chomsky's Normal Form (CNF) and GNF(Greibach Normal Form) with suitable examples	4M	BL3	CO5	V
35	Explain decidability and undesirability with examples	4M	BL3	CO5	V
36	Explain Post correspondence problem with example	4M	BL2	CO5	V
37	Discuss about Modified Post correspondence problem with example	4M	BL3	CO5	V
38	Explain about the Decision Properties and Closure Properties of CFL.	4M	BL3	CO5	V
39	Construct a Turing Machine(TM) that accepts the language $L=\{0^n 1^n \mid \text{where } n > 1\}$	4M	BL2	CO5	V
40	short notes on: i) P ii) NP iii) NP Hard iv) NP Complete with example.	8M	BL3	CO5	V
41	Illustrate the process of Recursive languages and Recursively enumerable Languages with suitable examples?	8M	BL3	CO5	V
42	Construct a Turing Machine $L=\{ a^n b^n c^n \mid n \geq 1 \}$	8M	BL2	CO5	V