

Register number \_\_\_\_\_



**SRM Institute of Science and Technology**  
**College of Engineering and Technology**  
**School of Computing**

SRM Nagar, Kattankulathur – 603203, Chengalpattu District, Tamilnadu

**Academic Year: 2022-23 (ODD)**

**B.Tech-Computer Science & Engineering**

**Test: CLA-T1**

**Date: 14.09.2022**

**Course Code & Title: 18CSC301T & Formal Languages and Automata Theory**

**Duration: 1 period**

**Year & Sem: III Year /V Sem**

**Max. Marks: 25**

**Set -A**

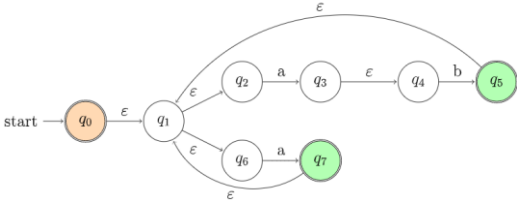
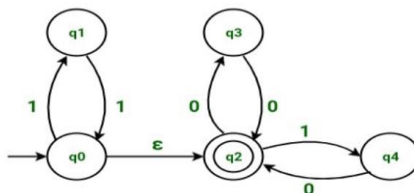
**Course articulation matrix:**

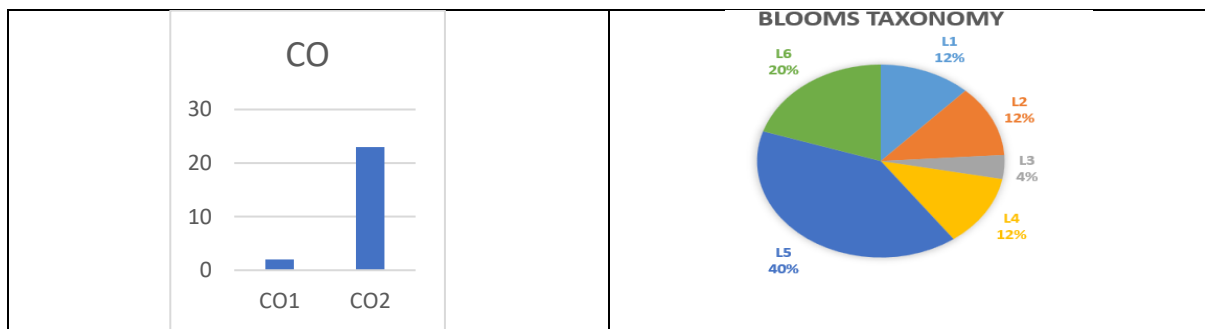
PLO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO 1	M	H	-	M	L	-	-	-	L	L	-	H	-	-	-
CO2	M	H	L	M	L	-	-	-	M	L	-	H	-	-	-
CO3	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CO4	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CO5	H	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CO6	L	H	-	H	L	-	-	-	L	L	-	H	-	-	-

**Part - A**

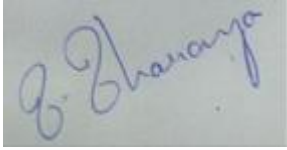
**Instructions: Answer all**

Q. No	Question	Marks	B L	C O	P O	PI Code
1	Consider $A=\{0,1,2,3,4,5,6,7\}$ . Then what can be inferred from $A^*$ ? a) Finite set of decimal numbers b) Set of all octal numbers c) Set of finite strings formed from numbers from $\{0-7\}$ d) Set of natural numbers	1	1	1	1	1.6.1
2	Which of the following is not a part of inductive proof? a) Basis                      b) induction c) Proof                      d) logical rules	1	1	1	1	1.6.1
3	Which of the following is false about Finite State Machines (FSM)? a) FSM has unique output state b) FSM can have multiple transitions for same input from same state c) All transitions should start from initial state d) Multiple transitions for multiple inputs can originate from same state	1	2	2	2	2.6.2
4	What is the minimum number of states to recognize the language $L=\{w/w \in (0+1+2)^+\}$ ? a) 1    b) 2    c) 3    d) 4	1	3	2	2	2.6.2
5	Give the regular expression that generate strings with "000" as substring over the input $\Sigma=\{0,1\}$ a) $(0+1)^*000(0+1)^*$ b) $(0+1)^*000$ c) $000(0+1)^*$ d) $(000)^*$	1	4	2	1	1.6.1
6	What can be told about the recognizing capability of NFA, DFA and $\epsilon$ -NFA? a) DFA is more powerful than NFA b) NFA is more powerful than DFA c) NFA is more powerful than $\epsilon$ -NFA	1	2	2	1	1.5.1

	d) The recognising power is same					
7	How many states are there in $\epsilon$ closure of $q_0$ in the given diagram?  a) 1 b) 2 c) 3 d) 4	1	4	2	2	<b>2.7.1</b>
8	Distinguishable states _____ a) Move to same output state for same input b) Move to different output state for same input c) Move to same output state for all inputs d) Move to same output state for unique inputs	1	1	2	2	<b>2.6.3</b>
9	Which one of the following regular expressions represents the set of all binary strings with an odd number of 1's? a) $10^*(0^*10^*10^*)^*$ b) $((0+1)^*1(0+1)^*1)^*10^*$ c) $(0^*10^*10^*)^*10$ d) $(0^*10^*10^*)^*0^*1$	1	4	2	2	<b>2.6.2</b>
10	Palindromes cannot be recognized by FSA because ---- a) It cannot match second half and first half b) It cannot be recognised using countable number of states c) It has many edges d) It has multiple final states	1	2	2	2	<b>2.6.3</b>
<b>Part-B (1 x 5=5 marks)</b>						
11	A leading firm in India is having a unique password setting scheme. Their employees must create their password adhering to the following rules: i) It should start with the letters { i, j, k } ii) The fifth symbol from the right end should be i. Create a FSA for this password scheme. Give the five-tuple structure for this FSA.	5	6	2	6	<b>6.3.1</b>
<b>Part-C (1 x 10=10 marks)</b>						
12	Give the DFA equivalent for the following: 	10	5	2	4	<b>4.2.1</b>



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**Course articulation matrix:**

PLO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO 1	M	H	-	M	L	-	-	-	L	L	-	H	-	-	-
CO2	M	H	L	M	L	-	-	-	M	L	-	H	-	-	-
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CO4	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CO5	H	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CO6	L	H	-	H	L	-	-	-	L	L	-	H	-	-	-

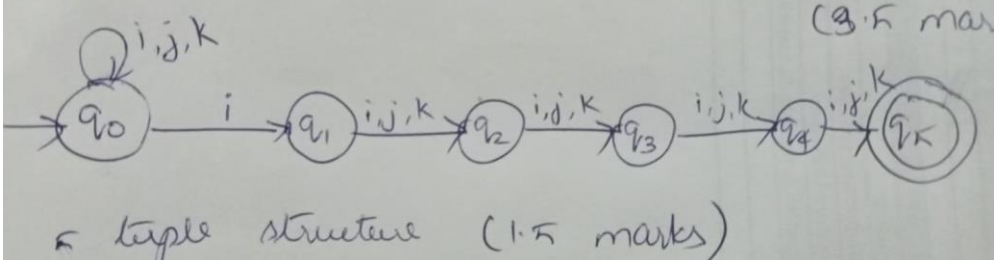
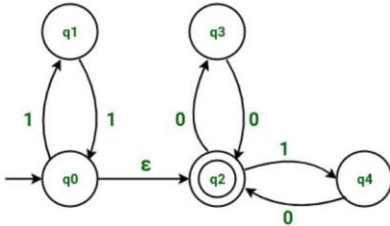
**Part - A**

**Instructions: Answer all**

Q. No	Question	Marks	BL	CO	PO	PI Code
1	Consider $A=\{0,1,2,3,4,5,6,7\}$ . Then what can be inferred from $A^*$ ? a) Finite set of decimal numbers b) Set of all octal numbers c) Set of finite strings formed from numbers from $\{0-7\}$ d) Set of natural numbers Ans: b)	1	1	1	1	1.6.1
2	Which of the following is not a part of inductive proof? a) Basis                      b) induction c) Proof                      d) logical rules Ans: d)	1	1	1	1	1.6.1
3	Which of the following is false about Finite State Machines (FSM)? a) FSM has unique output state b) FSM can have multiple transitions for same input from same state c) All transitions should start from initial state d) Multiple transitions for multiple inputs can originate from same state Ans: a)	1	2	2	2	2.6.2
4	What is the minimum number of states to recognize the language $L=\{w/w \in (0+1+2)^+\}$ ? a) 1    b) 2    c) 3    d) 4 Ans: b)	1	3	2	2	2.6.2

5	<p>Give the regular expression that generate strings with "000" as substring over the input <math>\Sigma=\{0,1\}</math></p> <p>a) <math>(0+1)^*000(0+1)^*</math>    b) <math>(0+1)^*000</math></p> <p>c) <math>000(0+1)^*</math>    d) <math>(000)^*</math></p> <p>Ans: a)</p>	1	4	2	1	<b>1.6.1</b>
6	<p>What can be told about the recognizing capability of NFA, DFA and <math>\epsilon</math>-NFA?</p> <p>a) DFA is more powerful than NFA</p> <p>b) NFA is more powerful than DFA</p> <p>c) NFA is more powerful than <math>\epsilon</math>-NFA</p> <p>d) The recognising power is same</p> <p>Ans: d)</p>	1	2	2	1	<b>1.5.1</b>
7	<p>How many states are there in <math>\epsilon</math> closure of <math>q_0</math> in the given diagram?</p> <p>a) 1    b) 2    c) 3    d) 4</p> <p>Ans: c or d</p>	1	4	2	2	<b>2.7.1</b>
8	<p>Distinguishable states _____</p> <p>a) Move to same output state for same input</p> <p>b) Move to different output state for same input</p> <p>c) Move to same output state for all inputs</p> <p>d) Move to same output state for unique inputs</p> <p>Ans: b)</p>	1	1	2	2	<b>2.6.3</b>
9	<p>Which one of the following regular expressions represents the set of all binary strings with an odd number of 1's?</p> <p>a) <math>10^*(0^*10^*10^*)^*</math>    b) <math>((0+1)^*1(0+1)^*1)^*10^*</math></p> <p>c) <math>(0^*10^*10^*)^*10</math>    d) <math>(0^*10^*10^*)^*0^*1</math></p> <p>Ans: a or b or c or d</p>	1	4	2	2	<b>2.6.2</b>
10	<p>Palindromes cannot be recognized by FSA because ----</p> <p>a) It cannot match second half and first half</p> <p>b) It cannot be recognised using countable number of states</p> <p>c) It has many edges</p> <p>d) It has multiple final states</p> <p>Ans: a)</p>	1	2	2	2	<b>2.6.3</b>
<b>Part-B (1 x 5=5 marks)</b>						
11	<p>A leading firm in India is having a unique password setting scheme. Their employees must create their password adhering to the following rules:</p> <p>i) It should start with the letters { i, j, k }</p> <p>ii) The fifth symbol from the right end should be i.</p> <p>Create a FSA for this password scheme. Give the five-tuple structure for this FSA.</p>	5	6	2	6	<b>6.3.1</b>

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	 <p>(3.5 marks)</p> <p>tuple structure (1.5 marks)</p>					
<b>Part-C (1 x 10=10 marks)</b>						
12	<p>Give the DFA equivalent for the following:</p>  <p>Steps: 8 marks Final Diagram: 2 marks</p>	10	5	2	4	<b>4.2.1</b>

$$E\text{-closure}(q_0) = \{q_0, q_2\} \rightarrow \textcircled{A}$$

$$\begin{aligned} \delta(A, 0) &= E\text{-close}(\delta(\{q_0, q_2\}, 0)) \\ &= E\text{-close}(\phi \cup q_3) = \underline{\underline{q_3}} \rightarrow \textcircled{B} \end{aligned}$$

$$\begin{aligned} \delta(A, 1) &= E\text{-close}(\delta(\{q_0, q_2\}, 1)) \\ &= E\text{-close}(q_1 \cup q_4) \\ &= \{q_1, q_4\} \rightarrow \textcircled{C} \end{aligned}$$

$$\begin{aligned} \delta(B, 0) &= E\text{-close}(q_3, 0) = E\text{-close}(q_2) \\ &= q_2 \rightarrow \textcircled{D} \end{aligned}$$

$$\delta(B, 1) = \phi$$

$$\begin{aligned} \delta(C, 0) &= E\text{-close}(\{q_1, q_4\}, 0) \\ &= E\text{-close}(\phi \cup q_2) = q_2 \rightarrow \textcircled{D} \end{aligned}$$

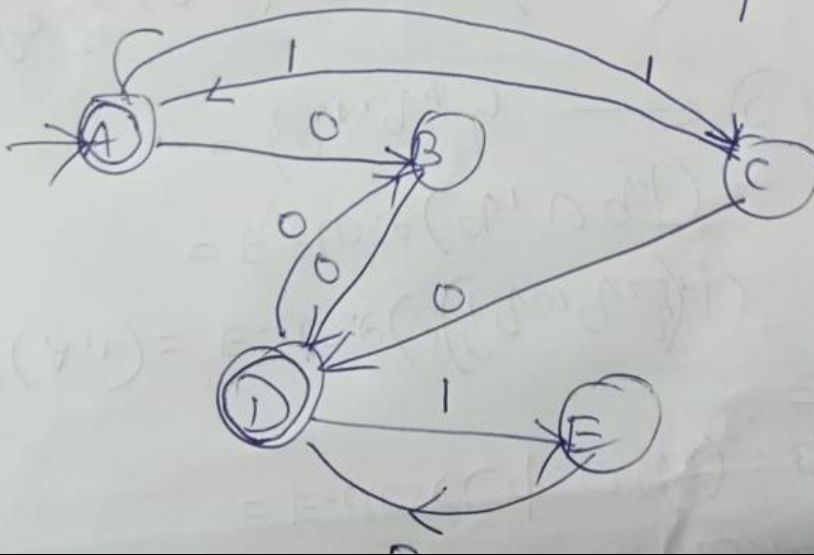
$$\delta(C, 1) = E\text{-close}(\{q_1, q_4\}, 1)$$

$$\delta(D,0) = \text{E-close}(q_{2,0}) = \text{E-close}(q_3) = q_3 \rightarrow (B)$$

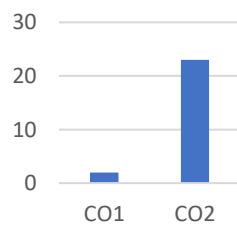
$$\delta(D,1) = \text{E-close}(q_{2,1}) = \text{E-close}(q_4) = q_4 \rightarrow (E)$$

$$\delta(E,0) = \text{E-close}(q_{4,0}) = q_2 \rightarrow (D)$$

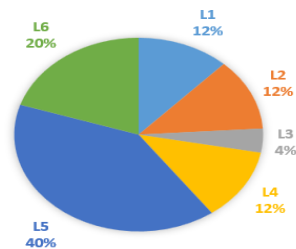
$$\delta(E,1) = \text{E-close}(q_{4,1}) = \phi$$



CO

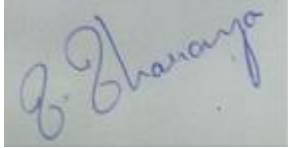


BLOOMS TAXONOMY

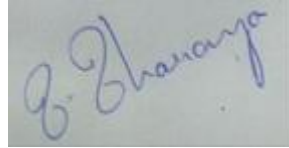




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A handwritten signature in blue ink, reading "B. Bhargava", is shown within a rectangular box.

**Question Paper Setter**

A handwritten signature in blue ink, reading "B. Bhargava", is shown within a rectangular box.

**Approved by ~~Audit Professor~~ / Course Coordinator**