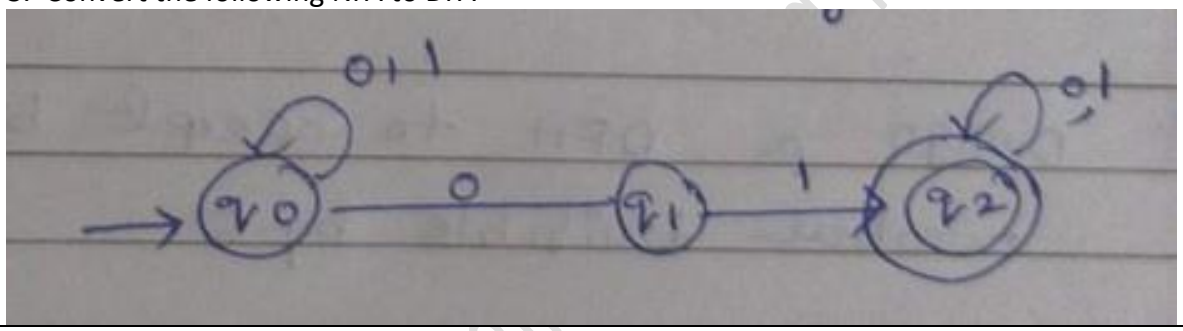
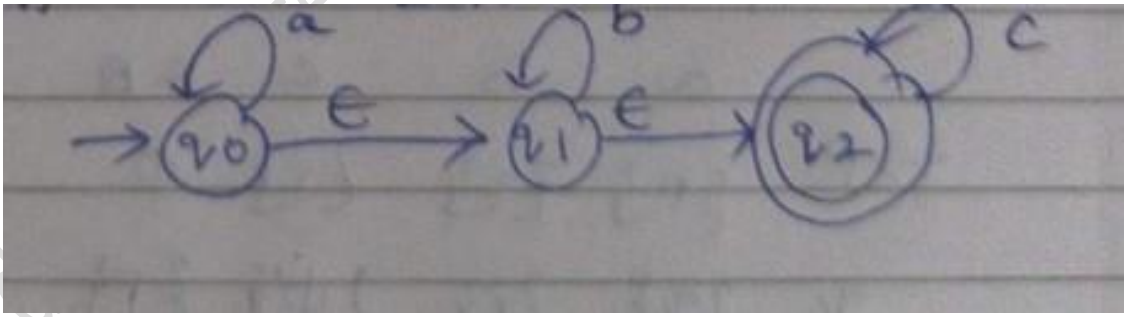
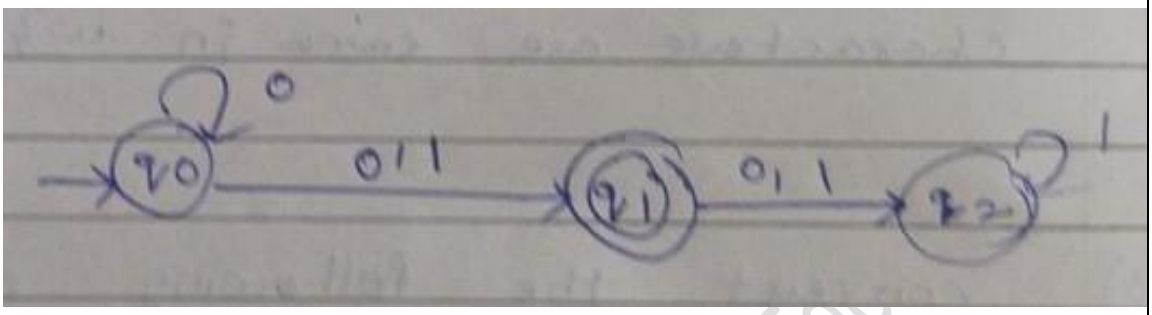
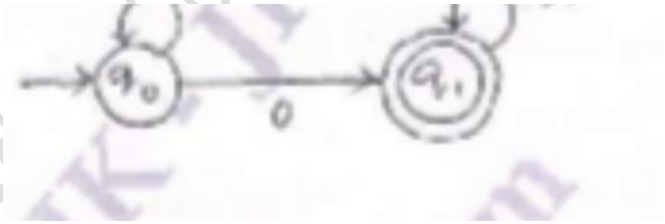
Semester:V	Department of Information Science and Engineering	AY: 2026-27
Course Code: BCS 503	Course Name: Theory of computation	

Question Bank

Q.	Module-01	M	L	C
1.	Define the following with example. i)alphabet ii) language iii) string iv) power of an alphabet v) concatenation of string	5	L1	CO1
2.	Define DFA. Draw a DFA to accept i)the set of all strings that contain a substring aba. ii) the set of all strings that contain a substring 001.	10	L3	CO1
3.	Define DFA. Draw a DFA to accept L = { w ∈ {a, b}* | no consecutive characters are same in w }	8	L3	CO1
4.	3. Convert the following NFA to DFA 	8	L2	CO1
5.	Convert the following ε-NFA to NFA and define ε-NFA 	10	L2	CO1
6.	Design a DFA to accept the following languages DFA to accept strings of 0's, 1's and 2's beginning with 0, followed by an odd number of 1's and ending with a 2.	8	L2	CO1

	Convert the following NFA to DFA 			
8.	**Obtain the DFA for the following ε-NFA** **a** **b** **c** **ε** → p {p} {q} {r} φ q {q} {r} φ {p} *r {r} φ {p} {q}	10	L 2	CO2
9.	Design a DFA to accept binary numbers divisible by 5	8	L 3	CO1
10.	Design a DFA to accept binary numbers divisible by 4	8	L 3	CO1
10.	Design a DFA to accept binary numbers divisible by 3	8	L 3	CO1
	Module-02			
11.	Define the regular expression.	3	L 1	CO1

Aditya College of Engineering and Technology

<table>
<tr><td>12.</td><td>Write the regular expression for L={W:|W| mod3==0 where ∑={a,b}</td><td>8</td><td>L 2</td><td>CO1</td></tr>
<tr><td>13</td><td>Write the regular expression for L={ strings of a' s and b 's starting with a and ending with b where ∑={a,b}.</td><td>3</td><td>L 2</td><td>CO1</td></tr>
<tr><td>14</td><td>Construct epsilon NFA for the regular expression(0+1)11(0+1)</td><td>5</td><td>L 2</td><td>CO2</td></tr>
<tr><td>15.</td><td>Construct epsilon NFA for the regular expression 1(1+0)*0</td><td>5</td><td>L 2</td><td>CO</td></tr>
<tr><td>13.</td><td>Construct epsilon NFA for the regular expression (0+1)*011*</td><td>5</td><td>L 2</td><td>CO</td></tr>
<tr><td>14</td><td>Minimize the following finite automata using Table filling algorithm :
<table>
<tr><th>δ</th><th>a</th><th>b</th></tr>
<tr><td>→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</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></td><td>8</td><td>L 2</td><td>CO</td></tr>
<tr><td>15</td><td>Obtain the Regular expression that denotes the language accepted by Fig. Q4(b).
Fig. Q4(b)

Using Kleene's theorem.</td><td>8</td><td>L 2</td><td>CO</td></tr>
<tr><td>16</td><td>State the Pumping Lemma for the Regular Languages. And also prove that the following languages are not regular.
i) L = {$0^n 1^m$ | n ≤ m} ii) L = {$0^n 1^m 2^n$ | n, m ≥ 1}.</td><td>8</td><td>L 2</td><td>CO2</td></tr>
<tr><td>17</td><td>Define regular expression. Write the regular expression for the following languages:</td><td>10</td><td>L 2</td><td>CO2</td></tr>
</table>

Aditya College of Engineering and Technology

	i) Representing for strings of a and b's having odd length. ii) To accept 10 as substring over an alphabet Σ = {0, 1}.			
18	State and prove pumping Lemma for regular languages.	10	L 2	CO2
19	Prove that regular languages are closed under complementation and intersection.	10	L 2	CO
20	i) Obtain NFA (Non deterministic finite automata) for the regular expression (a + b)* abb. ii) Obtain NFA for the regular expression (a* + ab) (a + b)*	10	L 2	CO
	Module - 03			
21	Define context free grammar. Write the CFG for the following languages: i) $L = \{a^n b^m c^n : n \geq 0, m \geq 0\}$ ii) $L = \{w \in \{a, b\}^* : n_a(w) = n^b(w)\}$	10	L 2	CO
22	i) Define ambiguous grammar with suitable example. ii) Consider the grammar E → + EE | * EE | - EE | x | y Find the left most derivation, right most derivation and parse tree for the string "+* -xyxy".	10	L 2	CO
23	Design CFG for the following languages : i) $L = \{a^n b^{n+2}, n \geq 0\}$ ii) $L = \{a^i b^j c^k, j = i + k, i \geq 0, k \geq 0\}$ iii) $L = \{w : \|w\| \bmod 3 > 0 \text{ where } w \in \{a\}^*\}$ iv) $L = \{a^m b^n \mid m \neq n\}$ v) Palindromes over 0 and 1.	10	L 2	CO
24	Define the following with example : i) Context free grammar ii) Left most Derivation iii) Parse tree iv) Ambiguous grammar.	4	L 1	CO
25	Consider the grammar G with productions. S → AbB | A | B ; A → aA | ε ; B → aB | bB | ε. Obtain LMD , RMD and parse tree for the string aaabab. Is the given grammar ambiguous?	10	L 2	CO

Aditya College of Engineering and Technology

***Note:**

1. All modules should contain a minimum of **10** questions each and the total number of questions must be **50**.
2. Questions can carry marks of 06, 07, 08, 09, 10 and for problems: 04 or 05.
3. Follow the RBTL as per the keywords used to frame the questions.
4. Maintain the Course Outcomes (COs) as per the syllabus.
5. M: Marks, L: RBTL, C:COs.

Aditya College of Engineering and Technology