VIT
Vellore Institute of Technology

School of Computer Science and Engineering

Winter Semester 2023-24

Continuous Assessment Test – 1

SLOT: B1+TB1

Programme Name &Branch: B.Tech

Course Name & code: BCSE304L Theory of Computation

Class Number (s): VL2023240500758, 0762, 0764, 0767, 0769, 0770, 0773, 0783, 0788, 0794, 0842, 0859, 1011, 1013, 1024, 1027, 1028, 1031, 1034, 1038, 1040

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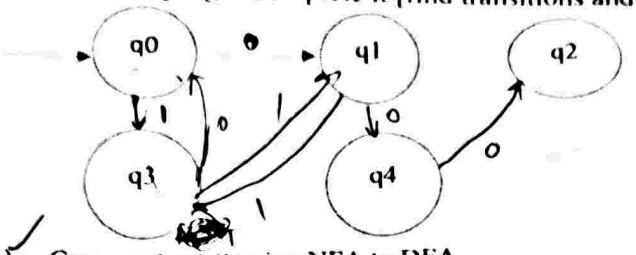
Exam Duration: 90 Min. **Maximum Marks: 50**

General instruction(s): - Step by Step Procedure is required to solve the Problem

<table>
<tr><th>Q.No.</th><th>Question</th><th>Max Marks</th></tr>
<tr><td>1.</td><td>a. Prove using mathematical induction for the following
$|uv| = |u| + |v|$ for u,v are strings over Σ. (3 Marks)
b. Consider A={00,10,20}, $\emptyset$ ={ }, L={ ε } and Σ = {0,1,2}. Then compute the following
1. L^*
2. $\emptyset^*$
3. Σ^2-A where – is a setminus operation. (4 Marks)
c. Give an example for
(i) L & L^c (c is a complementary operation of L) are infinite.
(ii) L is finite and L^c is infinite. (3 Marks)</td><td>10</td></tr>
<tr><td>2.</td><td>Convert the following NFA with ε to NFA without ε.
<table><tr><th></th><th>a</th><th>b</th><th>c</th><th>ε</th></tr><tr><td>-> q0</td><td>q0</td><td>Ø</td><td>Ø</td><td>q1</td></tr><tr><td>q1</td><td>Ø</td><td>q1</td><td>Ø</td><td>q2</td></tr><tr><td>* q2</td><td>Ø</td><td>Ø</td><td>q2</td><td>Ø</td></tr></table>Starting state : q0
Final State : q2</td><td>10</td></tr>
</table>

3. a) Construct a DFA which accepts all strings over the alphabet $\Sigma = \{0,1\}$ which can be seen as a binary representation of numbers that are divisible by 4. For example, number 5 corresponds to the string 101 (which is a binary number representation for 5) and the string 101 should be rejected by the DFA. The following is an incomplete attempt to construct the automata for the above language. Complete it [find transitions and final state(s)].



(5 Marks)

b) Convert the following NFA to DFA.

	a	b
-> q0	{q0,q1}	q0
q1	q2	q2
*q2	Ø	Ø

Starting state : q0
Final State : q2

(5 Marks)

10

4. i) Minimize the DFA whose transition table is given below.

	0	1
-> q0	q1	q3
q1	q2	q4
q2	q3	q2
*q3	q4	q5
*q4	q3	q4
*q5	q4	q5

Starting state : q0
Final State : {q3,q4,q5} (5Marks)

ii) Given a regular expression for the Language that contains **ab** or **ba** in the sting for $\Sigma = \{a,b\}$ (2 Marks)

iii) Convert the following Regular Expression to Finite Automata.
(a*+bc) (3 Marks)

10

5. Convert the given Finite Automata transition table to Regular Expression.

	a	b
-> q0	q1	q1
q1	q2	{q1,q3}
q2	Ø	q3
*q3	q3	Ø

Start State: q0
Final State: q3

10