H Roll No. .....

TCS–402

B. TECH. (FOURTH SEMESTER) MID SEMESTER EXAMINATION, April/May, 2022

FINITE AUTOMATA AND FORMAL LANGUAGE

Time : 1½ Hours

Maximum Marks : 50

Note : (i) Answer all the questions by choosing any ***one*** of the sub-questions.

(ii) Each question carries 10 marks.

1. (a) (i) Construct a DFA recognizing the following language (or strings) : $\{a^n b^m | n$ is divisible by 3 and m is divisible by 2 or $n - m \geq 1\}$.

10 Marks (CO1)

(ii) Find a DFA machine that accepts the language which has either odd

number of 0's or even number of 1's but not both together over alphabet $\Sigma = \{0,1\}$.

OR

(b) Construct a minimum state automaton equivalent to the finite automaton given in the following table :

State	Input $[\Sigma] \rightarrow$	
	a	b
→ q0	q0	q3
q1	q2	q5
q2	q3	q4
q3	q0	q5
q4	q0	q6
q5	q1	q4
(q6)	q1	q3

10 Marks (CO1)

2. (a) Write short notes on the following : 10 Marks (CO1)

(i) Kleene Closures
(ii) Generalized Transition Graph
(iii) Applications and Limitations of FA

OR

(b) Discuss the finite state machine with the help of an appropriate example. 10 Marks (CO1)

3. (a) Explain CHOMSKY classification of languages with example. 10 Marks (CO1)

OR

(b) Design DFA for a Language of string 0 and 1 that : 10 Marks (CO1)

(i) ending with 10
(ii) ending with 11
(iii) ending with 1

4. (a) State Arden's theorem. Consider a DFA machine, M = ({q1, q2, q3}, {0, 1} δ, q1, {q1}), where the transition function is defined as following :

δ (q1, 0) = q1, δ (q1, 1) = q2,
δ (q2, 0) = q3, δ (q2, 1) = q2,
δ (q3, 0) = q1, δ (q3, 1) = q2

Find a regular expression 'r' such that
L (r) = L (M). 10 Marks (CO2)

OR

(b) Write the statement of Pumping Lemma for regular languages. Show that L = { $a^n : n >= 2$, is a prime number} is not a regular language over $\Sigma = \{a\}$.

10 Marks (CO2)

5. (a) Consider the Mealy machine described by the trasition table given in table. Construct a Moore machine which is equivalent to the Mealy machine. 10 Marks (CO2)

P. State	Input a = 0		Input a = 1
	State	Output	State
q1	q3	0	q2
q2	q1	1	q4
q3	q2	1	q1
q4	q4	1	q3

OR

(b) Draw the NFA for the regular expression (a|b)* a b b with ϵ move. Convert this NFA to DFA using ϵ closure method.

10 Marks (CO2)