



SEMESTER I SESSION 2025/2026
SECI1013 DISCRETE STRUCTURE

ASSIGNMENT 4

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SECTION : 03



SECI1013:DISCRETE STRUCTURE SESSION 2025/2026 SEMESTER 1

ASSIGNMENT4 (FINITE AUTOMATA)

INSTRUCTIONS:

- i. This assignment must be conducted in group. Please clearly write the group member's names & matric numbers on the front page of the submission.
- ii. Solutions for each question must be readable and neatly written on plain A4 paper or digitally written. Every step or calculation should be properly shown. Failure to do so will result in the rejection of the submission of the assignment.
- iii. This assignment consists of 5 questions (35 marks), contributing 5 % of overall course marks.

QUESTION 1 [10 Marks]

Let $M = (\{q_0, q_1, q_2, q_3, q_4, q_5\}, \{a, b, c\}, q_0, f_s, \{q_1, q_3, q_5\})$ be the Deterministic Finite Automaton (DFA) with state transition function, f_s defined as follows:

$$\begin{array}{lll} f(q_0, a) = q_1 & f(q_0, b) = q_0 & f(q_0, c) = q_0 \\ f(q_1, a) = q_1 & f(q_1, b) = q_2 & f(q_1, c) = q_1 \\ f(q_2, a) = q_2 & f(q_2, b) = q_3 & f(q_2, c) = q_4 \\ f(q_3, a) = q_3 & f(q_3, b) = q_3 & f(q_3, c) = q_3 \\ f(q_4, a) = q_4 & f(q_4, b) = q_5 & f(q_4, c) = q_4 \\ f(q_5, a) = q_5 & f(q_5, b) = q_5 & f(q_5, c) = q_5 \end{array}$$

- a. Draw the transition table for the above machine (6 marks)
- b. Determine the final state for the input string abcc. (2 marks)
- c. Is the input string abcb accepted by the DFA? (2 marks)

QUESTION 2 [5 Marks]

Suppose that a language, L , is a C programming language style comment such that $L = \{ w \mid w \text{ is a C-style comment} \}$ with input alphabet, $\Sigma = \{ a, b, c, \dots, z, *, / \}$. Examples of accepted and rejected strings are shown in Table 1. Design a DFA that accepts language, L .

Question 1

fs	a	b	c
q0	q1	q0	q1
q1	q1	q2	q1
q2	q2	q3	q4
q3	q3	q3	q3
q4	q1	q5	q4
q5	q5	q5	q5

b)

$$q_0 \xrightarrow{a} q_1 \xrightarrow{b} q_2 \xrightarrow{c} q_4 \xrightarrow{c} q_4$$

final state : q_4

c)

$$q_0 \xrightarrow{a} q_1 \xrightarrow{b} q_2 \xrightarrow{c} q_4 \xrightarrow{b} q_5$$

final state: q_5 , set of final state = { q_1, q_3, q_5 }

Yes, abcb is accepted by DFA.

Question 2

$$M = \{S, \Sigma, q_0, fs, F\}$$

$$\Sigma = \{a, b, c, \dots, z, *, /\}$$

States, S:

q_0 - Start state

q_1 - Read /

q_2 - Read /* (inside comment)

q_3 - Inside comment, last symbol was *

q_4 - Accepting state (comment closed with */)

$$S = \{q_0, q_1, q_2, q_3, q_4\}$$

$$F = \{q_4\}$$

fs	/	*	L(a, b, c, ..., z)
q_0	q_1	q_0	q_1
q_1	q_0	q_2	q_0
q_2	q_2	q_3	q_2
q_3	q_4	q_3	q_2
q_4	-	-	-



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Table 1

Accepted Strings	Rejected Strings
/*abcz*/	/**
/**/	/**/bca/*aaz*/
/***/	aab/**/
/*abc*xyz*/	/*
/*a/b*/	/ab*/

QUESTION 3 [5 Marks]

Construct the state transition table for the Finite State Machine (FSM) defined by the transition diagram shown in Figure 1. Then find the output string for the input string 101011.

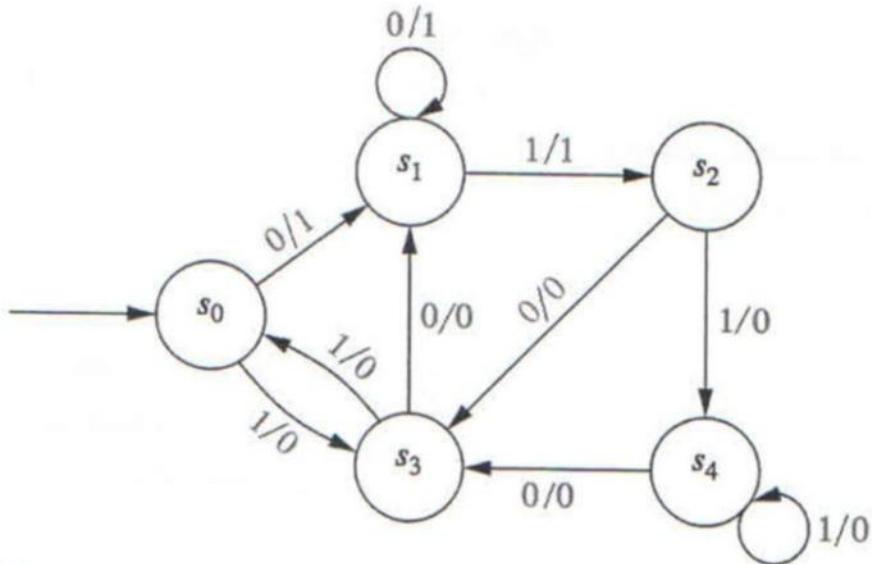


Figure 1

QUESTION 4 [5 Marks]

Construct a state transition diagram of a FSM that accepts the given set of strings over {a, b} at least one b.

Question 3

$$S = \{S_0, S_1, S_2, S_3\}$$

$$I = \{0, 1\}$$

$$O = \{0, 1\}$$

S_0 = initial state

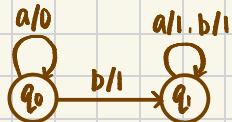
	f_S	f_O	
0	1	0	1
S_0	S_1	S_3	1
S_1	S_1	S_2	1
S_2	S_3	S_4	0
S_3	S_1	S_0	0
S_4	S_2	S_4	0

$$S_0 \xrightarrow[0]{1} S_3 \xrightarrow[0]{0} S_1 \xrightarrow[1]{1} S_2 \xrightarrow[0]{0} S_3 \xrightarrow[0]{1} S_0 \xrightarrow[1]{1} S_2$$

Output string - 001000

Question 4

	f_S	f_O	
a	b	a	b
q_0	q_0	q_1	0
q_1	q_1	q_1	1



Question 5

a) $M = \{S, I, O, q_0, f_S, f_O\}$

$$S = \{q_0, q_1\}$$

$$I = \{\text{up, down}\}$$

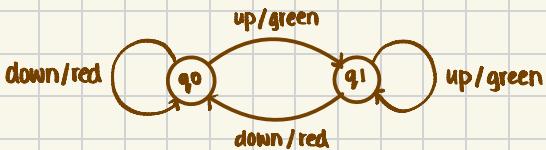
$$O = \{\text{green, red}\}$$

q_0 = initial state

q_f : $q_0, ff = q_1$

	f_S	f_O	
	up	down	up
q_0	q_1	q_0	green
q_1	q_1	q_0	red

b)





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QUESTION 5 [10 Marks]

A hypermarket with two floors is equipped with an elevator to assist customers during their shopping. The elevator serves two levels: the ground floor and the first floor. Its operation is controlled by a single button that has two possible commands: Up and Down. Two indicator lights inside the elevator display its current location, where a Red light represents the ground floor and a Green light represents the first floor. At each time interval, the control system reads the current floor and the input command, then moves the elevator and updates the indicator lights accordingly.

- a. Construct the state transition table by using given information. (5 marks)
- b. Draw the state transition diagram for this elevator mechanism. (5 marks)