Assignment-4

Group: 15

## Subject: Discrete Structure.

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QUESTION 1

Let M = {S, I, q0, fs, F) be the DFA such that S={q0, q1, q2, q3}, I={a,b}, F={q1}, q0=initial state and fs is given by:

fs (q0, a) = q1,	fs (q0, b) = q2
fs (q1, a) = q3,	fs (q1, b) = q2
fs (q2, a) = q1,	fs (q2, b) = q2
fs (q3, a) = q3,	fs (q3, b) = q2

i. Construct a state transition diagram of the DFA given the state transition function, fs.

f_s	a	b
q0	q1	q2
q1	q3	q2
q2	q1	q2
q3	q3	q2
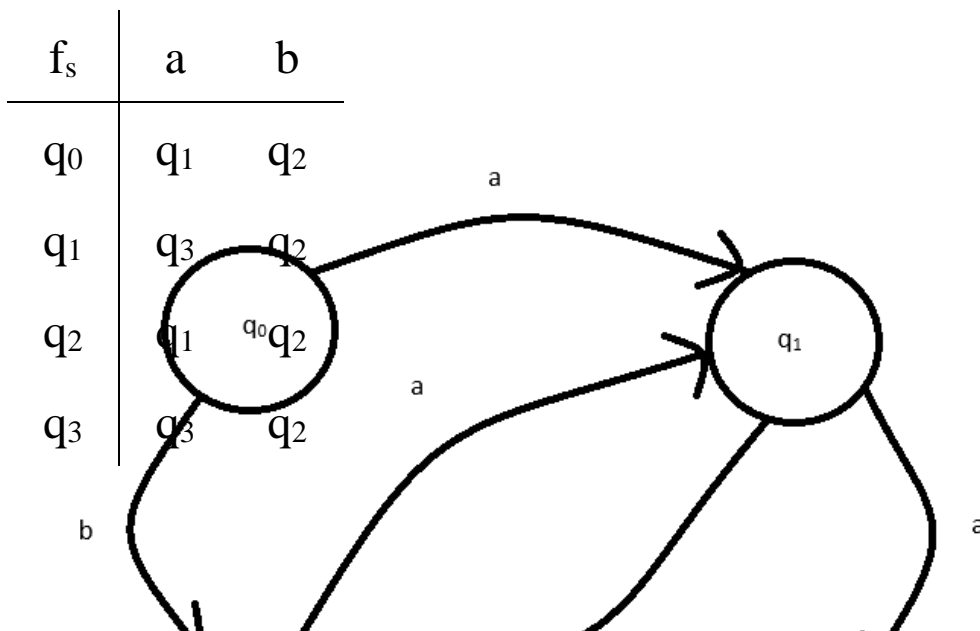
ii) DFA can be applied to verify the password of an email.

DFA can be used to first match the email and after that the password can be matched using the dfa with the password stored for an email address.

Beside this DFA can help to determine whether a password is invalid or not like there should be one integer at least and one alphabet, there cannot be any special character as it would lead to a

dead state. Minimum length password DFA could be built in order to accept a password with minimum length and all specification.
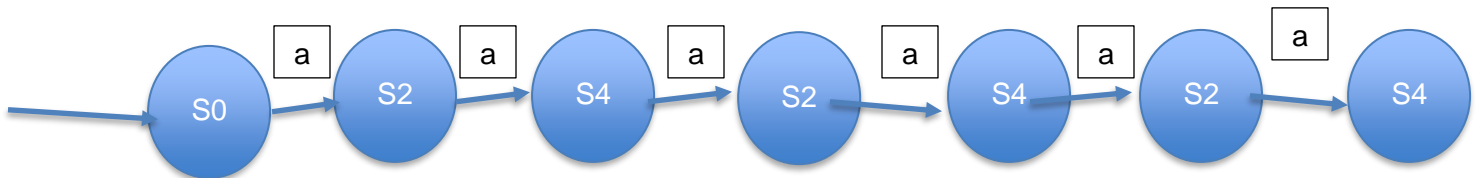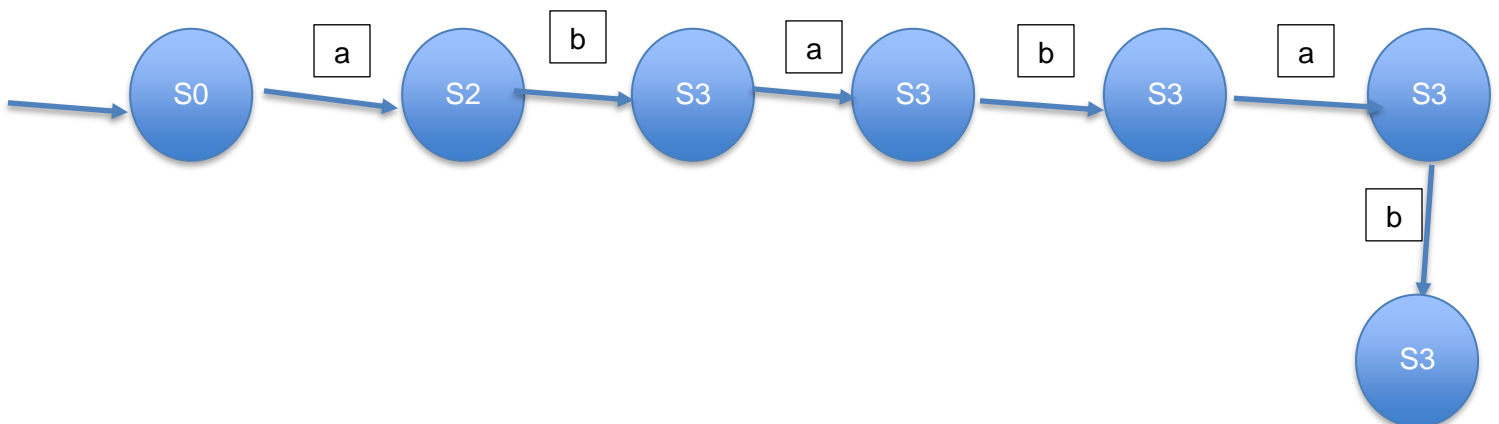
Question 2:

i)

S	a	b
S1	S2	S1
S2	S3	S1
S3	S4	S3
S4	S3	S3
S5	S2	S4

ii)

a) W = aaaaaa

b) W = ababab

Question 3:

i.

a)

States $S=\{S_0,S_1,S_2,S_3,S_4,S_5\}$
Input symbols $I=\{1,0\}$

Start state $q_0=S_0$
Final states $F=\{S_0,S_5\}$
b)

Given string: 0011101100

Current state	Input	Next State
S_0	0	S_0
S_0	0	S_0
S_0	1	S_1
S_1	1	S_2
S_2	1	S_3
S_3	0	S_5
S_5	1	S_5
S_5	1	S_5
S_5	0	S_4
S_4	0	S_4

Since at the end of the string we are at state S4 and since S4 is not a final state, therefore, the string is not accepted by the DFA.

0

ii.
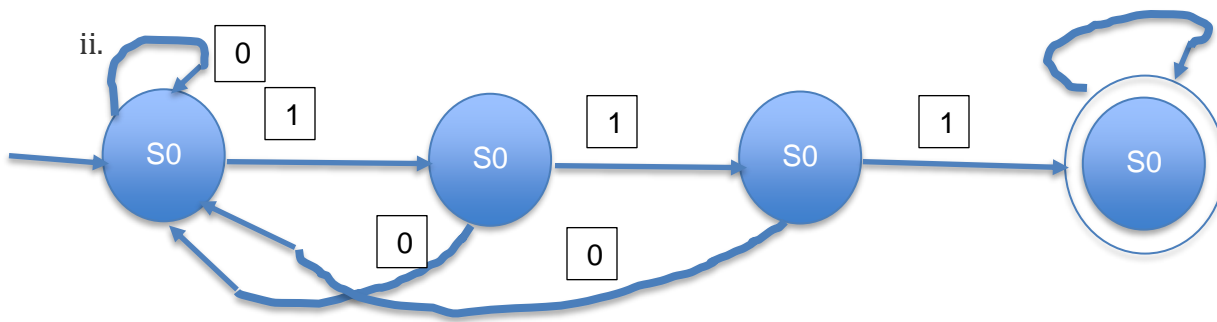
QUESTION 4

States:

q_0: Wander

q_1: Evade

q_2: Attack

Input:

A: not enemies

B: enemies & not vulnerable

C: enemies & vulnerable

Output:

0: shoot

1: not shoot

State	Input			Output		
	A	B	C	A	B	C
q_0	q_0	q_2	q_1	0	1	1
q_1	q_0	q_2	q_1	0	1	1
q_2	q_0	q_2	q_1	0	1	1

Question 5

State	Input									Output								
	A	B	C	D	E	F	G	H	I	A	B	C	D	E	F	G	H	I
S_1	S_2	S_1	S_1	S_1	S_1	S_1	S_1	S_1	S_1	0	0	0	0	0	0	0	0	0
S_2	S_2	S_3	S_9	S_2	S_2	S_2	S_2	S_2	S_2	0	0	1	0	0	0	0	0	0
S_3	S_3	S_3	S_3	S_6	S_4	S_3	S_3	S_3	S_3	0	0	0	0	0	0	0	0	0
S_4	S_4	S_4	S_4	S_6	S_5	S_4	S_4	S_4	S_4	0	0	0	0	0	0	0	0	0
S_5	S_5	S_5	S_5	S_6	S_9	S_5	S_5	S_5	S_5	0	0	0	0	2	0	0	0	0
S_6	S_6	S_6	S_6	S_6	S_6	S_7	S_6	S_6	S_6	0	0	0	0	0	0	0	0	0
S_7	S_7	S_7	S_7	S_7	S_7	S_7	S_8	S_7	S_7	0	0	0	0	0	0	0	0	0
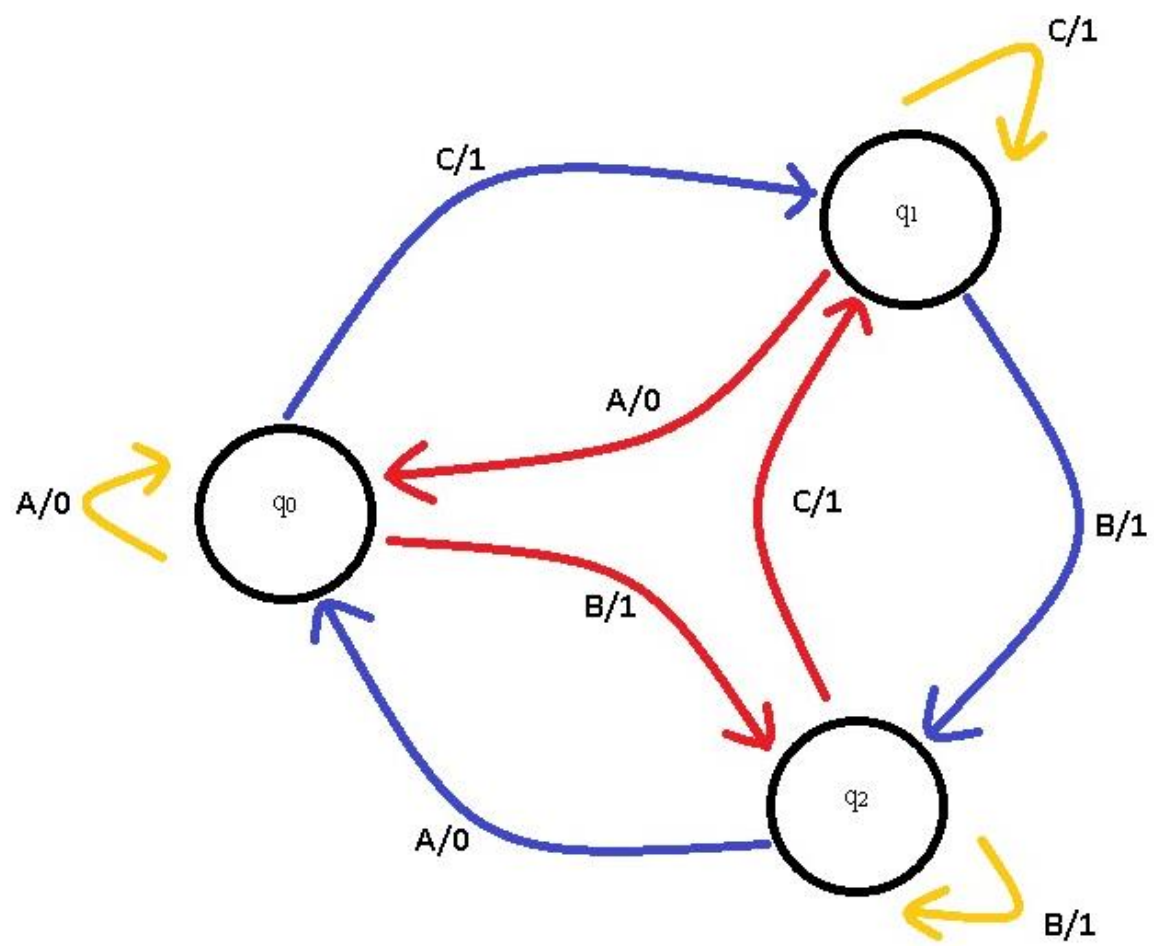
S₈	S₈	S₈	S₈	S₈	S₈	S₈	S₈	S₆	S₉	0	0	0	0	0	0	0	0	1
S₉	S₉	S₉	S₉	S₉	S₉	S₉	S₉	S₉	S₉	1	1	1	1	1	1	1	1	1