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UNIVERSITI TEKNOLOGI MALAYSIA

IN SLIDE EXERCISE FOR CHAPTER 5

GROUP 5

SECTION 03 - SEM 1, 2024/2025

SECI1013 (*DISCRETE STRUCTURE*)

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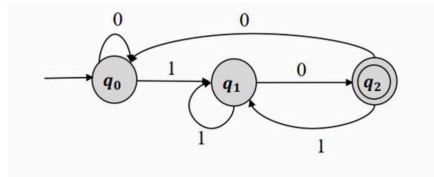
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“Foundation of structured problem-solving”



Exercise 1



Based on the DFA in Example 5, which of the given strings are accepted by M?

- i) 0111010
- ii) 00111
- iii) 111010
- iv) 0100
- v) 1110

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35

ANSWER:

$$(i) \quad q_0 \xrightarrow{0} q_0 \xrightarrow{1} q_1 \xrightarrow{1} q_1 \xrightarrow{1} q_1 \xrightarrow{0} q_2 \xrightarrow{1} q_1 \xrightarrow{0} q_2$$

Accepted.

$$(ii) \quad q_0 \xrightarrow{0} q_0 \xrightarrow{0} q_0 \xrightarrow{1} q_1 \xrightarrow{1} q_1 \xrightarrow{1} q_1$$

Not accepted.

$$(iii) \quad q_0 \xrightarrow{1} q_1 \xrightarrow{1} q_1 \xrightarrow{1} q_1 \xrightarrow{0} q_2 \xrightarrow{1} q_1 \xrightarrow{0} q_2$$

Accepted.

$$(iv) \quad q_0 \xrightarrow{0} q_0 \xrightarrow{1} q_1 \xrightarrow{0} q_2 \xrightarrow{0} q_0$$

Not accepted.

$$(v) \quad q_0 \xrightarrow{1} q_1 \xrightarrow{1} q_1 \xrightarrow{1} q_1 \xrightarrow{0} q_2$$

Accepted.



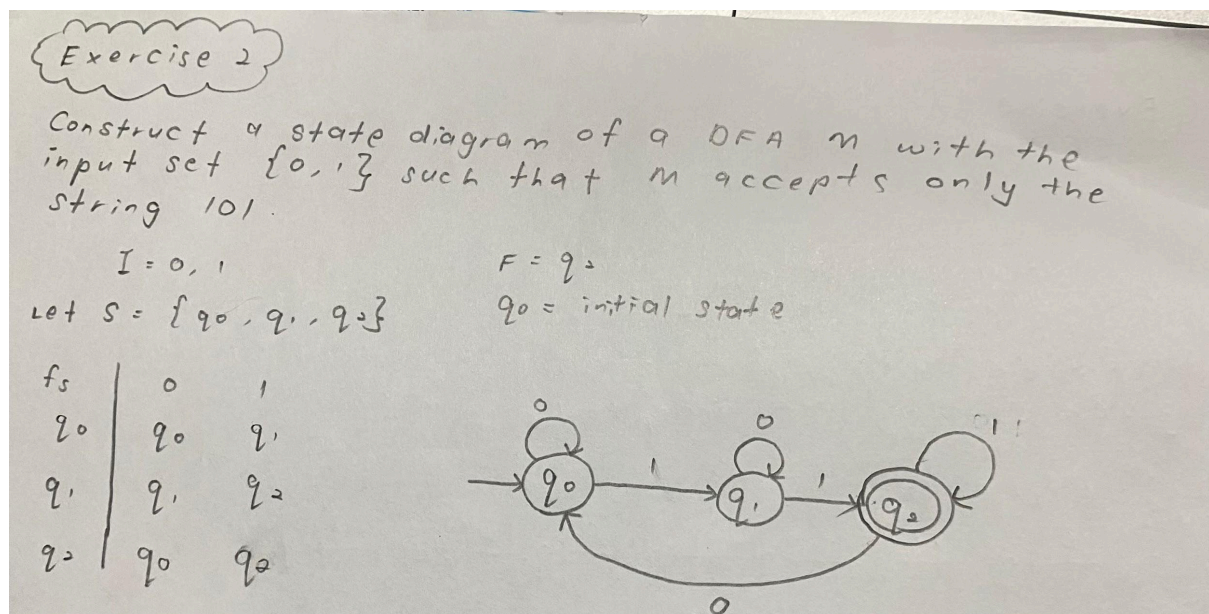
Exercise 2

Construct a state transition diagram of a DFA M with the input set $\{0,1\}$ such that M accepts only the string 101.

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ANSWER:





Exercise 3

ATM is a computerized machine that provides bank customers to gain access to their accounts using magnetic encoded plastic card and code number. It enables the customer to perform online transactions without involving cashier, clerk and bank teller. The customer make cash withdrawal, check account balances, transfer money as well as purchase prepaid mobile phone credit by using ATM card.

Typical PIN based ATM has following processes:

- Insert ATM card to establish interface. The card will be validated to ensure the correct ATM card is inserted. If the card is unsuccessfully validated, the card is ejected and ATM session is terminated.
- For valid ATM card, user is asked to enter the PIN and press the execution key for the system to match the PIN, if PIN does not matches, then user access is denied to the next stage and he or she is requested to repeat the operation with the correct PIN for a fixed two retries.
- If after the third time the PIN is unmatched, the card will be locked and ATM session is terminated.
- If the PIN matches then the transaction interface is displayed and user has to select the transaction that they wish to perform.
- After the machine performs the chosen transaction, it will prompt user if a new transaction is to be performed. If the response is "Yes", the transaction interface is again displayed and if "No" the transaction is terminated and card ejected and ATM session is terminated.

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Exercise 3

Based on the above description, the states, inputs and outputs are as follow:

States:

S ₁ : Welcome screen	S ₆ : Choosing transaction screen
S ₂ : Validating card	S ₇ : Performing transaction
S ₃ : 1 st PIN entering screen	S ₈ : Asking for other transaction screen
S ₄ : 2 nd PIN entering screen	S ₉ : Terminate ATM session
S ₅ : 3 rd PIN entering screen	

Inputs:

A: Insert ATM card	F: Transaction is selected
B: Valid ATM card	G: Complete transaction
C: Invalid ATM card	H: Yes for other transaction
D: Correct PIN	I: No for other transaction screen
E: Incorrect PIN	

States:

0: Nothing happened
1: Eject ATM card
2: Lock ATM card

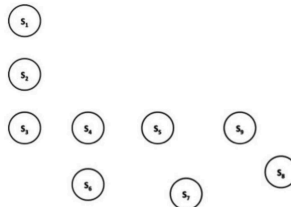
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Exercise 3

Redraw and complete the transition diagram for the above system



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ANSWER:

Redraw and complete the transition diagram for the above system

