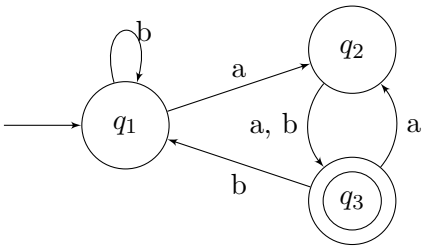
Assignment 1

1. Consider the finite automaton $M_1$ and answer the following questions.



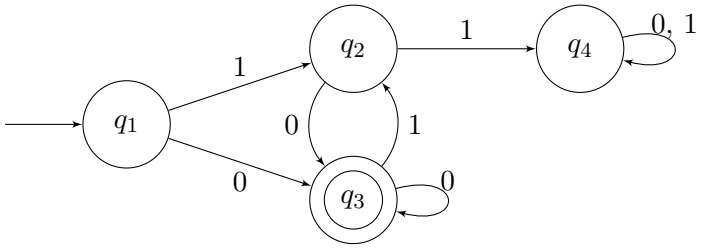

   (a) What is the start state?
   (b) What is the set of accept states?
   (c) What sequence of states does $M_1$ go through on input *abab*?
   (d) Does $M_1$ accept the string *abab*?
   (e) Does $M_1$ accept the empty string, $\epsilon$?
   (f) Define $M_1$ formally.

2. The formal description of a finite state machine $M_2$ is $(\{q_1, q_2, q_3, q_4, q_5\}, \{u, d\}, \delta, q_3, \{q_3\})$, where $\delta$ is given by the following table.

| | u | d |
|---|---|---|
| $q_1$ | $q_1$ | $q_2$ |
| $q_2$ | $q_1$ | $q_3$ |
| $q_3$ | $q_2$ | $q_4$ |
| $q_4$ | $q_3$ | $q_5$ |
| $q_5$ | $q_4$ | $q_5$ |

   Draw the state diagram of $M_2$.

3. Consider the finite automaton $M_3$ and answer the related questions.



(a) For each of the following strings specify whether or not it is accepted/recognized by $M_3$.

i. 0100
ii. 1001
iii. 0101
iv. 1
v. 11111
vi. 0101011

(b) Describe in English the language that $M_3$ accepts/recognizes.

4. Consider alphabet $\Sigma = \{0, 1\}$.

(a) Design a finite state machine that accepts all strings that end with 01.

(b) Design a finite state machine whose language includes only the empty string.