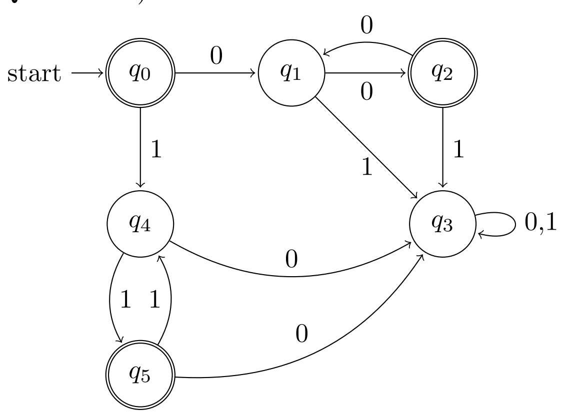
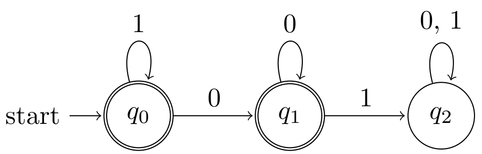
# COMP 3602 Assignment 1

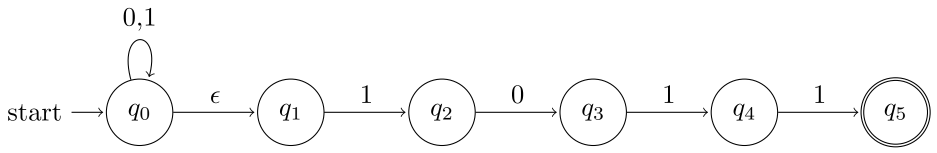
Question 1a)



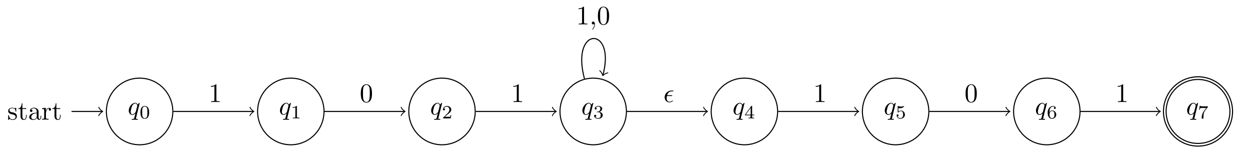

Question 1b)



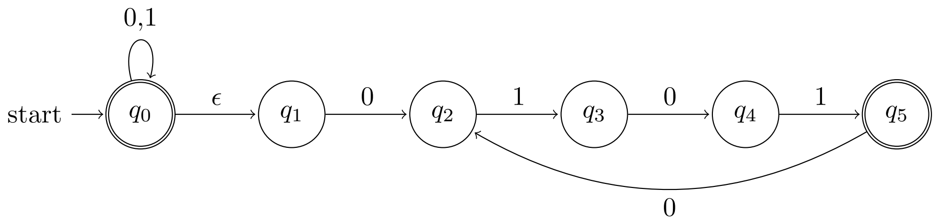
Question 2a)




Question 2b)




Question 2c)



Question 3)

M = $(\{q0, q1, q2, q3, q4, q5\}$,$\{0, 1\}$,$\delta$,q0,$\{q0, q2, q4\})$
where $\delta$ is

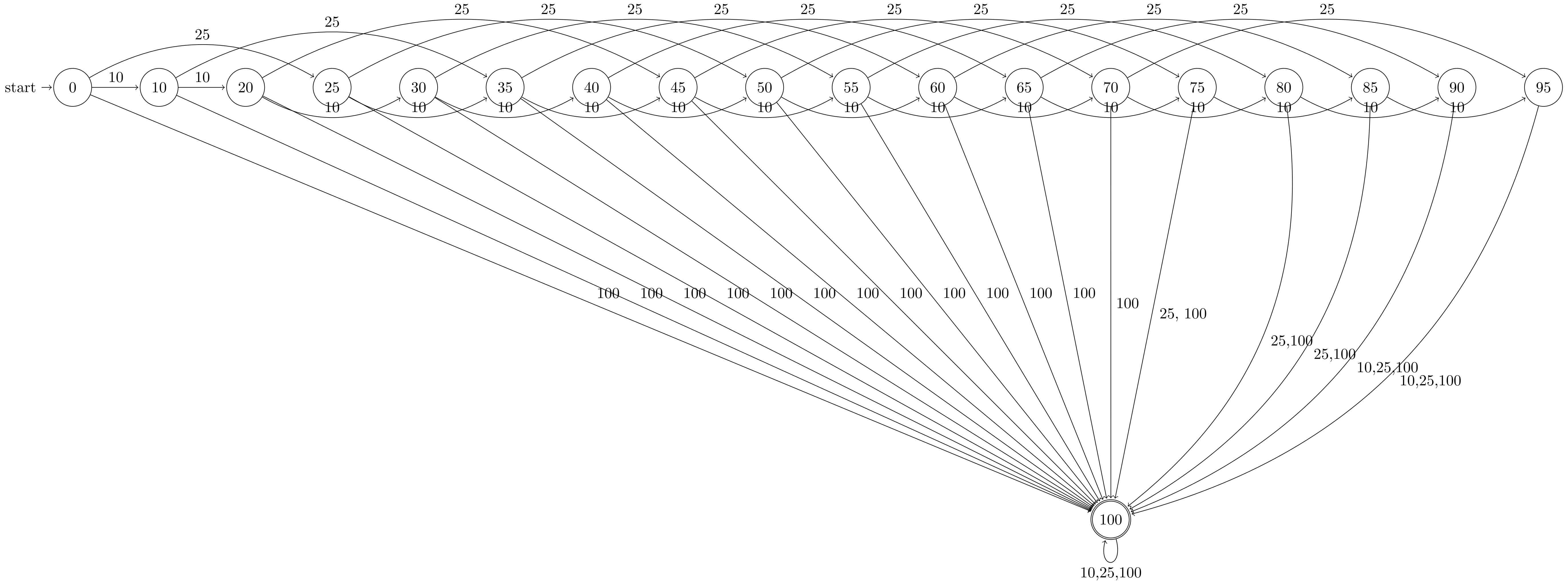
| | 0 | 1 |
|---|---|---|
| q0 | q1 | q4 |
| q1 | q2 | q3 |
| q2 | q1 | q3 |
| q3 | q3 | q3 |
| q4 | q3 | q5 |
| q5 | q3 | q4 |

Question 4)

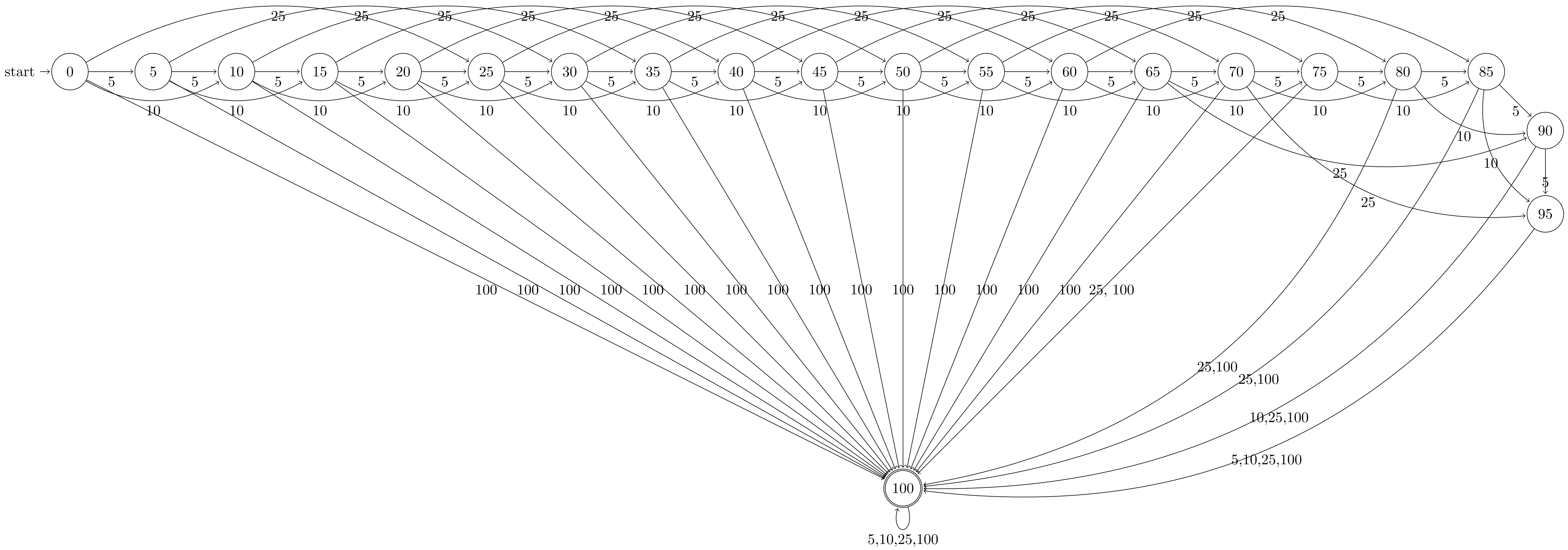
M = $(\{q0, q1, q2, q3, q4, q4, q5, q6, q7\}$,$\{0, 1\}$,$\delta$,q0,$\{q7\})$
where $\delta$ is

| | 0 | 1 | $\epsilon$ |
|---|---|---|---|
| q0 | $\emptyset$ | q1 | $\emptyset$ |
| q1 | q2 | $\emptyset$ | $\emptyset$ |
| q2 | $\emptyset$ | q3 | $\emptyset$ |
| q3 | q3 | q3 | q4 |
| q4 | $\emptyset$ | q5 | $\emptyset$ |
| q5 | q6 | $\emptyset$ | $\emptyset$ |
| q6 | $\emptyset$ | q7 | $\emptyset$ |
| q7 | $\emptyset$ | $\emptyset$ | $\emptyset$ |

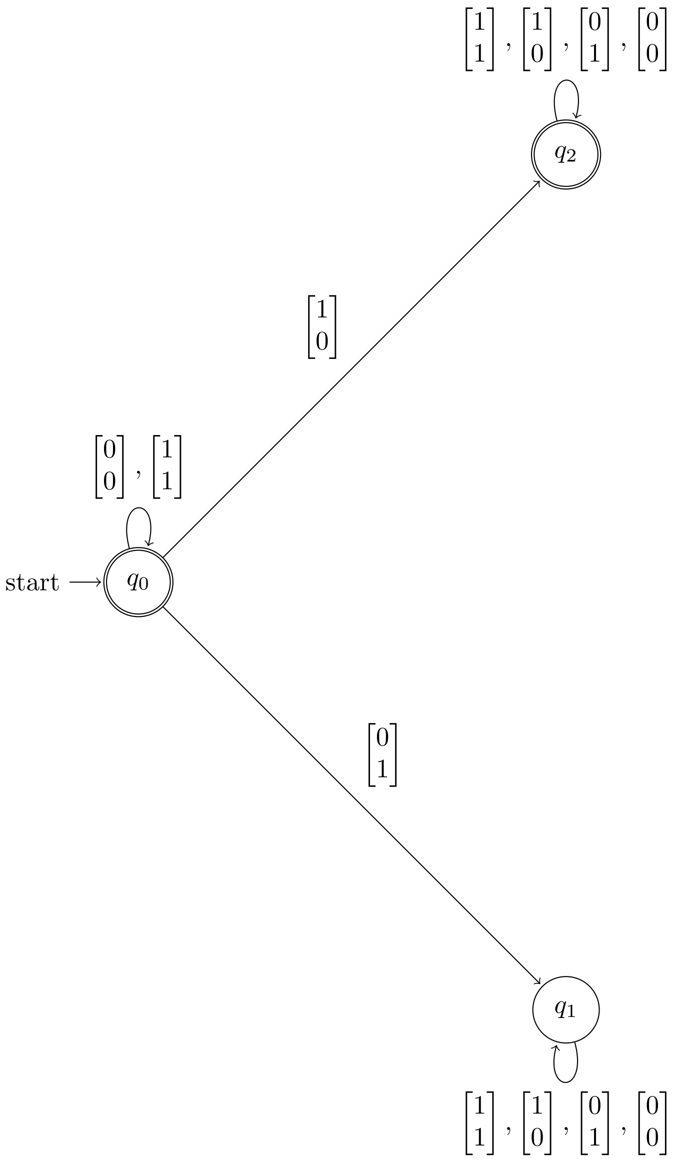
Question 5


start
0
10
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
10
25
100
25, 100
25,100
10,25,100

Question 5 (with 5c pieces)



Question 6)


$\begin{bmatrix}1\\1\end{bmatrix}, \begin{bmatrix}1\\0\end{bmatrix}, \begin{bmatrix}0\\1\end{bmatrix}, \begin{bmatrix}0\\0\end{bmatrix}$
$q_2$
$\begin{bmatrix}1\\0\end{bmatrix}$
$\begin{bmatrix}0\\0\end{bmatrix}, \begin{bmatrix}1\\1\end{bmatrix}$
start
$q_0$
$\begin{bmatrix}0\\1\end{bmatrix}$
$q_1$
$\begin{bmatrix}1\\1\end{bmatrix}, \begin{bmatrix}1\\0\end{bmatrix}, \begin{bmatrix}0\\1\end{bmatrix}, \begin{bmatrix}0\\0\end{bmatrix}$

Question 7) $L_1 - L_2 = L_1 \cap \overline{L_2}$

Since $L_1$ is regular, $\overline{L_2}$ (complement of $L_2$) is regular and intersection are all closed under the set of regular languages then $L_1 \cap \overline{L_2}$ is regular.

Question 8) We assume that ADD is regular.

Let p be the puming length given by the pumping lemma

we let s be the string

$1^p = 0 + 1^p$

Because $s \in B \wedge s > p$ we guarentee that $s$ can be split into three piece $s = xyz$ where these three things must hold

i) $xy^iz \in ADD, i >= 0$

$ii)|xy| <= p$

$iii)|y| > 0$

Suppose y contains only 1's

let $y = 1^m$ such that $m >= 1$

$xy = 1^p$

$x = 1^{p-m}$

$z = (= 0 + 1^p)$

$xyz(1^{p-m})(1^m)(= 0 + 1^p)$

suppose $i = 0$

$xy^iz = (1^{p-m}(1^m)^0(= 0 + 1^p)$

$= 1^{p-m} = 0 + 1^p$

if $m >= 1, p - m \neq p$

Hence $\exists i$ such that $xy^iz \notin ADD$

Question 9)

a)

Accept:

a

b

Reject:

ba

bbaa

b)

Accept:

a

aba

Reject:

b

ba

c)

Accept:

a

bb

Reject:

aa

aab

d)

Accept:

$\epsilon$b

ab

Reject:

aab

bb