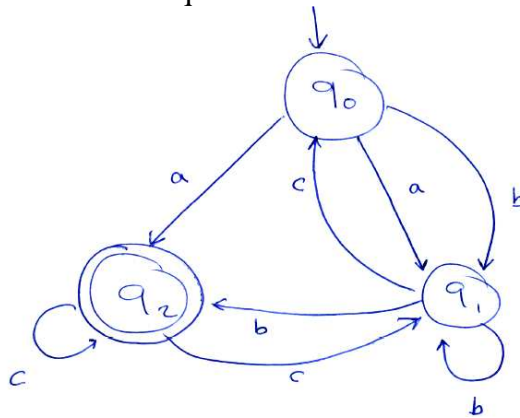




**Objective:** This part aims to check student abilities to construct DFSA from NFSA as language acceptor machine.

**Q1/(6 marks)**

Convert the following NFSA machine to the equivalent DFSA machine:



Handwritten student work showing the conversion of the NFSA to a DFSA. The work includes a transition table and a state transition diagram.

$\delta(q_0, a) = q_{12}$	$\delta(q_{012}, a) = q_{12}$
$\delta(q_0, b) = q_1$	$\delta(q_{012}, b) = q_{12}$
$\delta(q_0, c) = \phi$	$\delta(q_{012}, c) = q_{012}$
$\delta(q_1, a) = \phi$	
$\delta(q_1, b) = q_{12}$	
$\delta(q_1, c) = q_0$	
$\delta(q_2, a) = \phi$	
$\delta(q_2, b) = \phi$	
$\delta(q_2, c) = q_{12}$	
$\delta(q_{01}, a) = q_{12}$	
$\delta(q_{01}, b) = q_{12}$	
$\delta(q_{01}, c) = q_0$	
$\delta(q_{12}, a) = \phi$	$\delta(q_{02}, a) = q_{12}$
$\delta(q_{12}, b) = q_{12}$	$\delta(q_{02}, b) = q_1$
$\delta(q_{12}, c) = q_{012}$	$\delta(q_{02}, c) = q_{12}$

The diagram shows the DFSA with states  $q_0, q_1, q_2, q_{01}, q_{012}, q_{02}, q_{12}$ .  $q_0$  is the start state and  $q_{12}$  is the final state. Transitions are drawn in red ink, corresponding to the table above.

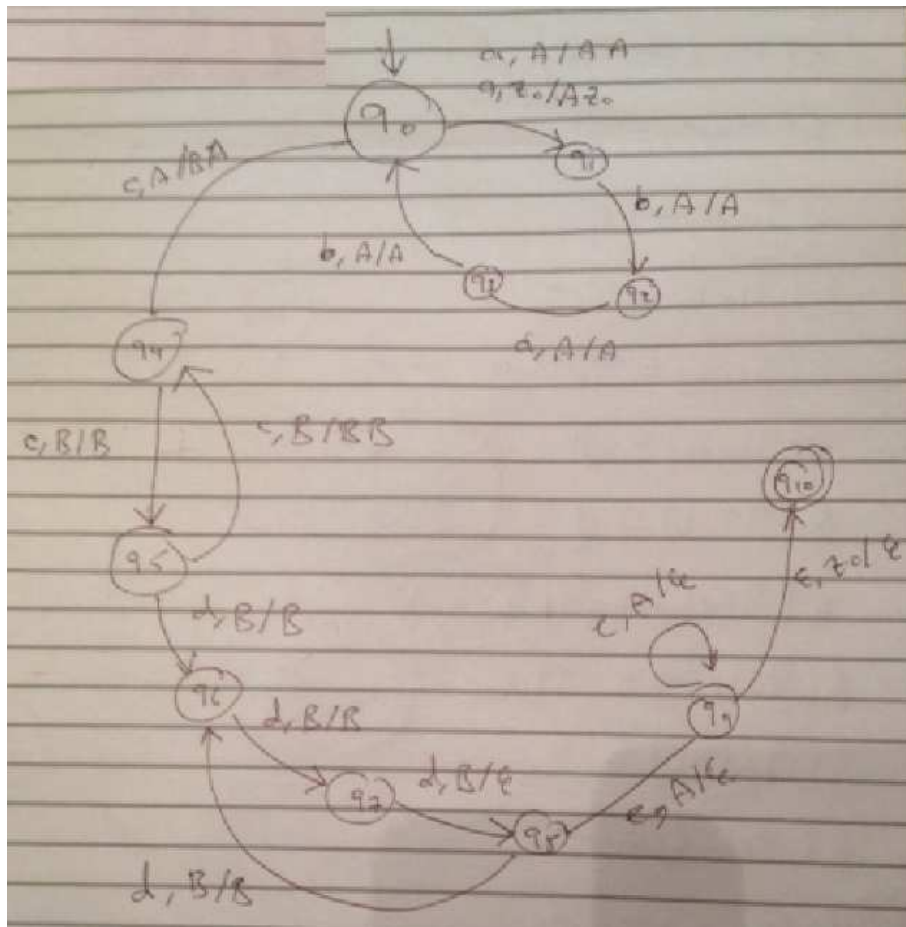
Q2/(7 marks)

Construct PDA as language acceptor that recognizes each of the following languages:

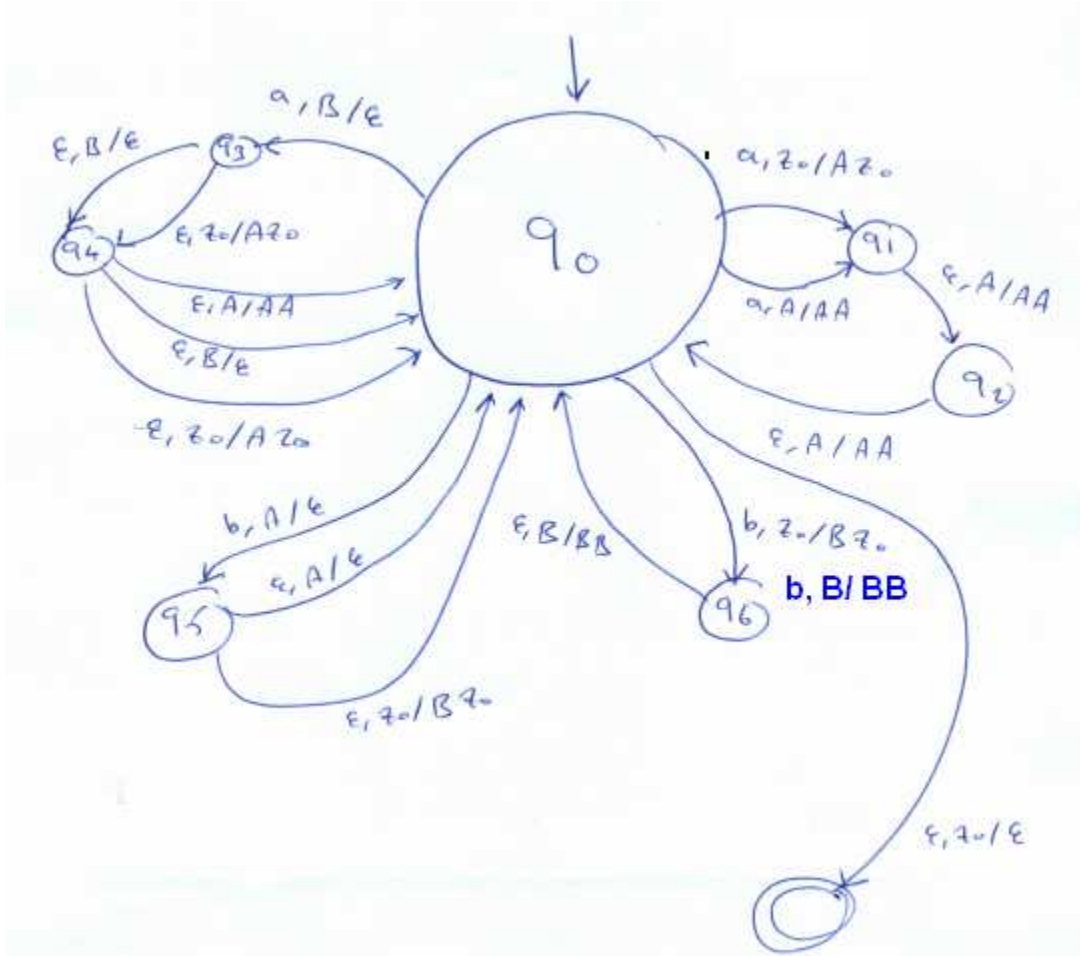
1 -  $L = \{(ab)^{2m} c^{2n} d^{3n} e^m \mid n, m \geq 1\}$

2 -  $L = \{(a + b)^* \mid \text{where the ratio between number of as' and number of bs' is } 2:3\}$

1-



2-

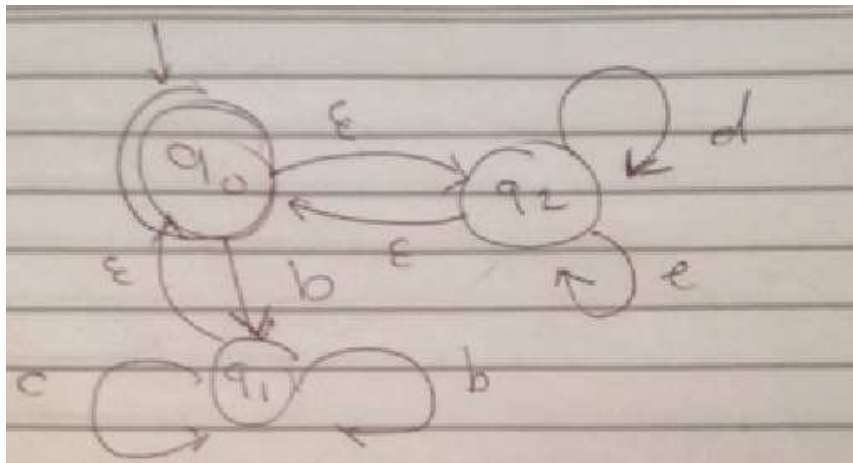


Q3/(7 marks)

Construct NFA that accept the following regular expressions:

- 1 -  $(b(b+c)^* + (d+e)^*)^*$
- 2 -  $(bc)^+ + (a+b)^*$

1-



2-

