3. Give regular expressions that generate each of the following languages. In all cases, the alphabet is $\Sigma = \{0, 1\}$. [5x2]

(a) The language $\{ w \in \Sigma^* \mid |w| \text{ is odd} \}$.

(b) The language $\{ w \in \Sigma^* \mid w \text{ has an odd number of 1's} \}$.

(c) The language $\{ w \mid w \text{ contains at least two 0's, or exactly two 1's} \}$.

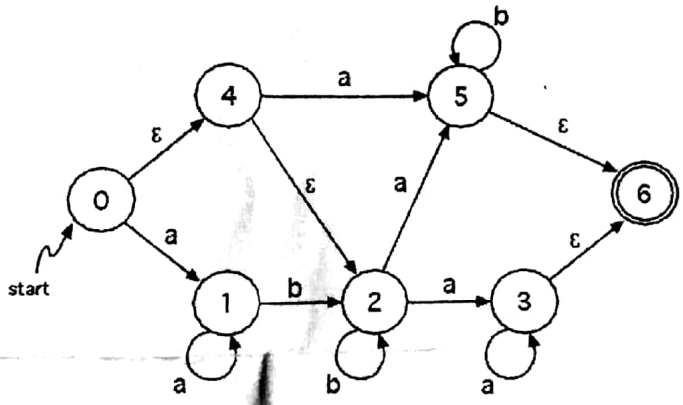
(d) The language $\{ w \in \Sigma^* \mid w \text{ ends in a double digit} \}$.

(e) The language $\{ w \in \Sigma^* \mid w \text{ does not end in a double digit} \}$.

4. a) Write regular expressions for the following language over the alphabet $\Sigma = \{0, 1\}$:

i) All strings that do not end with 11. [3]

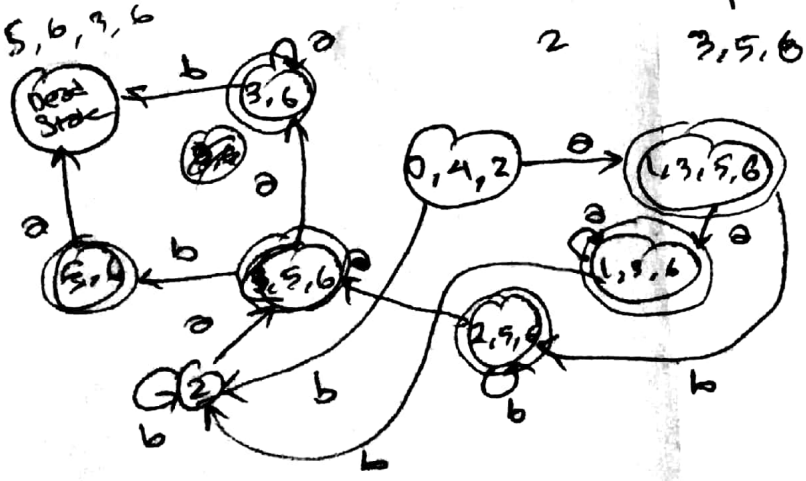
b) Convert the following NFA to DFA. $\Sigma = \{a, b\}$ [7]

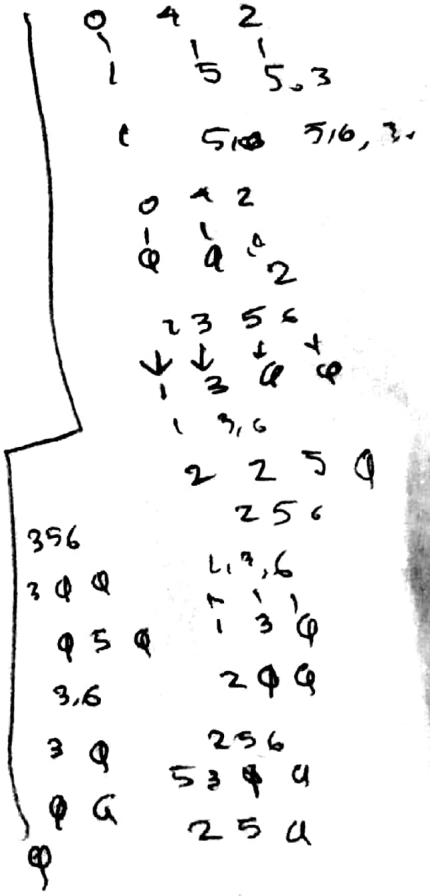


encloses

0 - 0,4,2
1 - 1
2 - 2
3 - 3,6
4 - 4,2
5 - 5,6
6 - 6

states	a	b
0,4,2	1,3,5,6	2
1,3,5,6	1,3,6	256
1,3,6	1,3,6	2
2,5,6	3,5,6	2,5,6
3,5,6	3,6	5,6
3,6	3,6	q
3,6	q	5,6
2	3,5,6	2





MIDTERM EXAMINATION

Fall 2017

CSE 331: Automata and Computability

Total Marks: 30 **Time Allowed: 1 Hour**

[Answer Any 3]

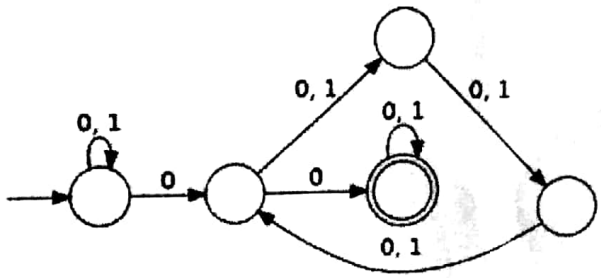
Student ID : **Name:** **Section:**

NB: To understand the question is a part of the exam.

Write your Instructor's Initial on top of your answer script.

1. a) Consider the following non-deterministic finite automaton (NFA) over $\Sigma = \{0, 1\}$.

Give a one-sentence description of the language recognized by the NFA. Generate regular expression from this NFA by state elimination [1+5]



b) Design NFA for this regular expression : ab*+b* (a*ba)*+ (a*b*)* [2]

c) Design NFA for this language: $\Sigma = \{a, b\}$

L =all strings that contain even number a's or at most 2 b's. [2]

2.a) Design a **DFA** for $\Sigma = \{a, b, c\}$ that accepts any string that contains only one occurrence of the substring "abc". Verify that your DFA works by finding out extended transition function, $\hat{\delta}$ $(q_0, abcaab)$, where assume q_0 is the start state. [5+1]

b) Write down the transition table for following DFA , $\Sigma = \{a,b\}$? Also write the language represented by this DFA. [2+2]