



United International University (UIU)

Dept. of Computer Science & Engineering (CSE)

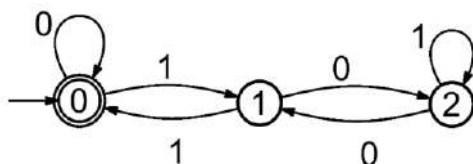
Midterm Exam: Trimester: Spring 2020

Course: CSI 233/CSE 2233, Theory of Computing/Computation

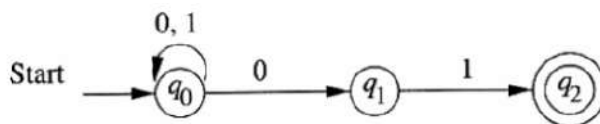
Marks: 30, Time: 1 hour 45 minutes

Answer all the questions. Numbers to the right of the questions denote their marks.

1. a) Design a DFA that accepts only the strings of 0 and 1 whose length is a multiple of 3. [2]
b) Design a DFA that accepts only the strings of 0 and 1 that start and end with the same symbol. Also, show the five components of the automaton. [2+2]
c) Convert the following DFA to an equivalent Regular Expression: [4]

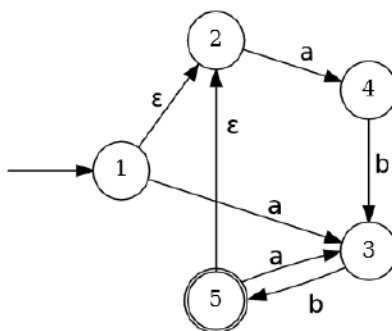


2. a) Draw the state diagram of an NFA/ ϵ -NFA for alphabet set $\{a, b\}$ which starts and ends with "ab". [2]
b) Draw the state diagram of an NFA/ ϵ -NFA for alphabet set $\{a, b\}$ which contains a 'b' in its third position from the last. [Sample accepted strings: "abba", "baa", "ababab"]. [2]
c) Consider the following NFA, and show with the help of NFA-tree whether the string "001010" is accepted or not. [2]



- d) Convert the following Regular Expression to ϵ -NFA over the alphabet $\Sigma = \{0, 1\}$: [4]
 $(((00)^* (11)) \cup 01)^*$

3. a) Write Regular Expressions for the following languages: [2+2]
I. $\{w \mid w \text{ ends with an even nonzero number of 0's}\}$
II. $\{w \mid w \text{ has at least 3 characters and the 3rd character is 0}\}$
b) Consider the following ϵ -NFA: [1+1+4]



- I. Write down the ***transition table*** for this ε -NFA.
- II. Compute the ε -closure of the states **1** and **5**.
- III. Convert this ε -NFA to an equivalent DFA.