



United International University (UIU)

Dept. of Computer Science & Engineering (CSE)

Mid Exam Spring 2023

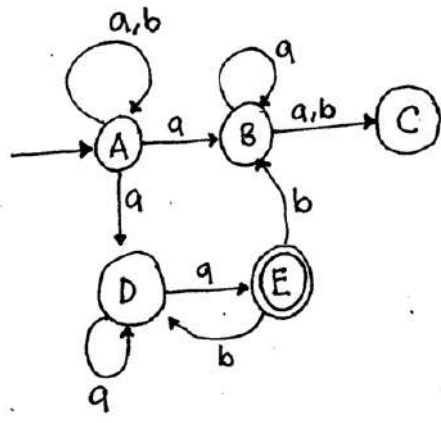
CSE 2233/CSI 233: Theory of Computation/Theory of Computing

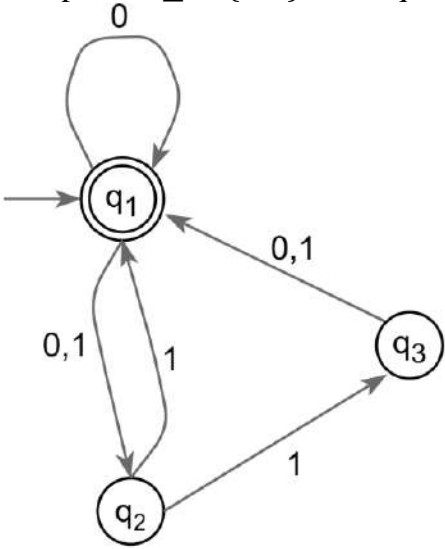
Total Marks: **30**

Duration: 105 Minutes

Answer all questions. Figures in the right-hand margin indicate full marks.

Any examinee found adopting unfair means will be expelled from the trimester / program as per UIU disciplinary rules.

1.	<p>Design DFAs that accepts the following languages:</p> <p>a) $L = \text{contains even number of 'a' and ends with 'bc'}$ $\Sigma = \{a, b, c\}$</p> <p>b) $L = \text{does not contain 'mmn'}$ $\Sigma = \{m, n, w\}$</p> <p>c) $L = \text{starts with 'gh' and contains 'kgh' and ends with 'gh'}$ $\Sigma = \{g, h, k\}$</p>	3 x 3
2.	<p>Design NFAs that accepts the following languages:</p> <p>a) $L = \text{starts with 'p', and contains 'rqp', and ends with 'qr'}$ $\Sigma = \{p, q, r\}$</p> <p>b) $L = \text{starts with '11' or '21', and contains '210', and ends with '101'}$ $\Sigma = \{0, 1, 2\}$</p> <p>c) $L = \text{starts with 'xyz' and contains 'yyz' or 'zyx' and ends with 'zy'}$ $\Sigma = \{x, y, z\}$</p>	3 x 3
3.	<p>Consider the following NFA, and show with the help of NFA-tree whether the string "aabaa" is accepted or not.</p> 	3

4.	<p>Convert the following NFA over alphabet $\Sigma = \{0, 1\}$ to an equivalent DFA.</p>  <pre> graph TD start(()) --> q1(((q1))) q1 -- 0 --> q1 q1 -- 1 --> q2((q2)) q2 -- "0,1" --> q1 q2 -- 1 --> q3((q3)) q3 -- "0,1" --> q1 </pre>	6
5.	<p>Design Regular Expression for the following languages where $\Sigma = \{a, b\}$:</p> <ol style="list-style-type: none"> All strings w having even length strings and starting with <i>a</i> or odd length strings starting with <i>b</i>. All strings w which begins and ends with <i>b</i>. All strings w where every <i>a</i> is followed by at least one <i>b</i>. 	3