

United International University (UIU)

Dept. of Computer Science & Engineering (CSE)

Mid Exam Summer 2023

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

Total Marks: **30** Duration: 1 Hour 45 Minutes

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

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

1. Design **DFA**'s that accepts the following languages:

 2.5×4

- a) $L = \{w \mid w \text{ does not contain '101'}\} \mid \Sigma = \{0,1\}$
- **b)** $L = \{w \mid w \text{ starts with an even number of 'a', contains 'ba' and ends with 'baa'} | \Sigma = \{a,b\}$
- c) $L = \{w \mid w \text{ is a palindrome with a max length of 3} \mid \Sigma = \{0,1\}$
- **d)** L = { $a^i b^j | i \ge 0, j \ge 0, i + j \text{ is an odd number} } | \Sigma = \{a, b\}$

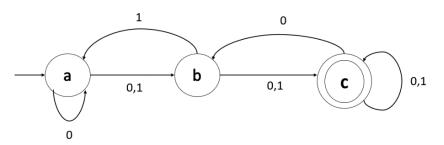
2. Design NFA's that accepts the following languages:

 3×3

- a) L= {w | w doesn't start with 'a' or 'b' and contains 'bbc' and ends with 'ab'} $|\sum = \{a, b, c\}$
- **b)** L= {w | w starts with '10' or '21' and contains '220' and ends with '112'} $|\sum = \{0, 1, 2\}$
- c) $L = \{w \mid w \text{ starts and ends with either 'xzy' or 'xy'}\} \mid \sum = \{x, y, z\}$

3. Consider the following NFA, and show with the help of **NFA-tree** whether the string '0100110' is accepted or not.

3



4. Convert the following NFA over alphabet $\Sigma = \{1,2,3\}$ to an equivalent DFA including the diagram.

	1	2	3
\rightarrow a	{a,b,d}	{a,c}	{d}
b	ф	{a,d}	{a,e}
*c	{a,b,c,d,e}	ф	{b,c}
d	{d,e}	{d}	{a,e}
*e	{b,e}	ф	ф

4

4

5. Convert the following ϵ -NFA over alphabet $\Sigma = \{0,1\}$ to an equivalent DFA.

