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.

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1. Design **DFA**'s that accepts the following languages: 2.5 x 4

a) L = {w | w does not contain '101'} | Σ= {0,1}

b) L = {w | w starts with an even number of 'a', contains 'ba' and ends with 'baa'} | Σ = {a,b}

c) L = {w | w is a palindrome with a max length of 3} | Σ = {0,1}

d) L = { $a^i b^j$ | i ≥ 0, j ≥ 0, i + j is an odd number} | Σ = {a, b}

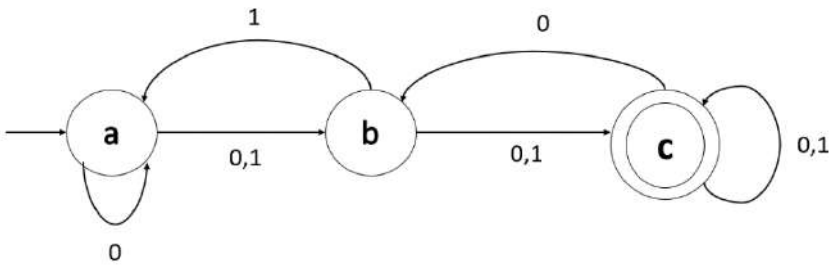
2. Design **NFA**'s that accepts the following languages: 3 x 3

a) L= {w | w doesn't start with 'a' or 'b' and contains 'bbc' and ends with 'ab'} | ∑ = {a, b, c}

b) L= {w | w starts with '10' or '21' and contains '220' and ends with '112'} | ∑ = {0, 1, 2}

c) L = {w | w starts and ends with either 'xzy' or 'xy'} | ∑ = {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 $\sum = \{1,2,3\}$ to an equivalent DFA including the diagram. 4

	1	2	3
→ a	{a,b,d}	{a,c}	{d}
b	ϕ	{a,d}	{a,e}
*c	{a,b,c,d,e}	ϕ	{b,c}
d	{d,e}	{d}	{a,e}
*e	{b,e}	ϕ	ϕ

5. Convert the following ϵ-NFA over alphabet $\sum = \{0,1\}$ to an equivalent DFA. 4