United International University (UIU)

Dept. of Computer Science & Engineering (CSE)

Mid Exam Spring 2024

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

Total Marks: **30** Duration: 1 Hour 30 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 DFAs that accepts the following languages: 3x3

a) L = { w | w starts with "**23**", contains "**443**" as a substring and ends with "**32**" }
Where, ∑ = {2,3,4}

b) L = { w | w ends with either "**01**" or "**10**" } Where, ∑ = {0, 1}

c) L = { w| w contains an **odd** number of **b**'s, and ends with **'ac'** } Where, Σ = {a, b, c}

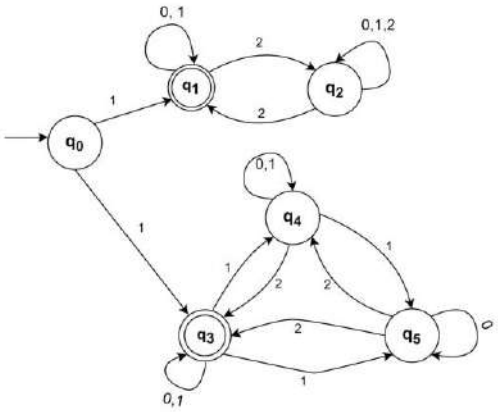
2. Design NFAs that accepts the following languages: 3x3

a) L= {w | w ends with '**b**' and contains '**bca'**} | Σ = {a,b,c}

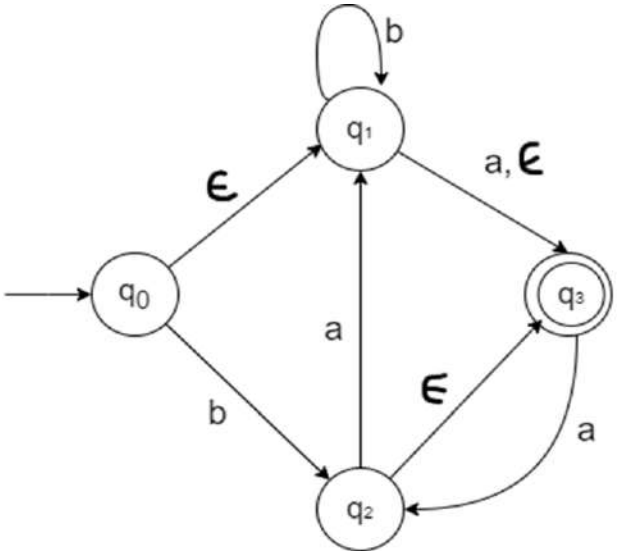
b) L= {w | w starts and ends with different symbols when the total length is a multiple of 2} | Σ = {0,1}

c) L = {w | w starts with '**xy**' and contains '**xxy**' or '**yyz**' or '**zzx**' and ends with '**yz**'} | Σ = {x, y, z}

3. Consider the following NFA, and show with the help of NFA-tree whether the string "**1012212**" is accepted or not. 3



4. Convert the following **ε**-NFA over the ∑ = {a,b} to an equivalent DFA. 6



5. Design Regular Expression for the following languages where ∑ = {a, b}: 3

a) W | W contains not more than one occurrence of the substring '**aa**'

b) W | W does not end with '**ab**'

c) W | W starts with **b** and ends with **b**