# 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.***

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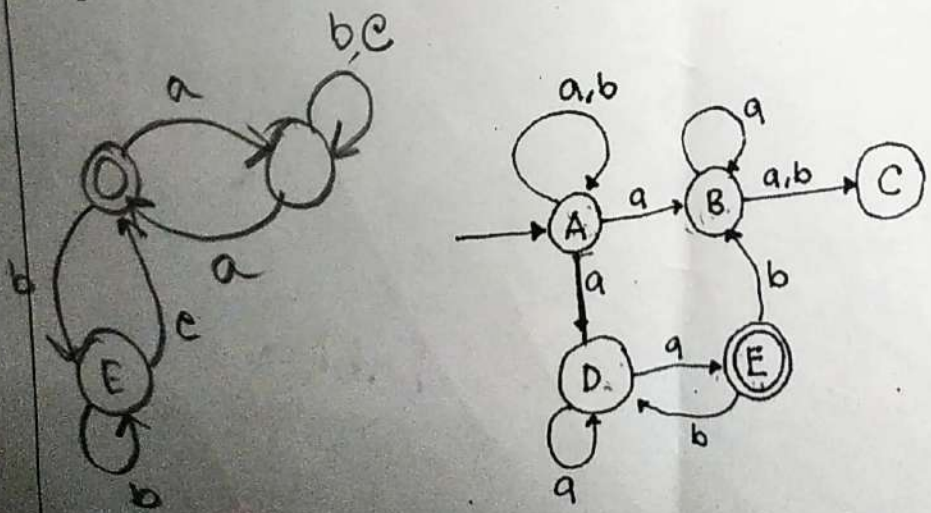
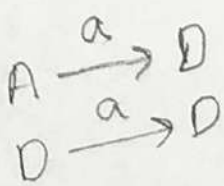
|---|---|---|
| **1.** | Design DFAs that accepts the following languages:<br>**a)** L= contains even number of 'a' and ends with 'bc' \| $\sum$ = {a, b, c}<br>**b)** L = does not contain 'mnm' \| $\sum$ = {m,n,w}<br>**c)** L = starts with 'gh' and contains 'kgh' and ends with 'gh' \| $\sum$ = {g,h,k}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

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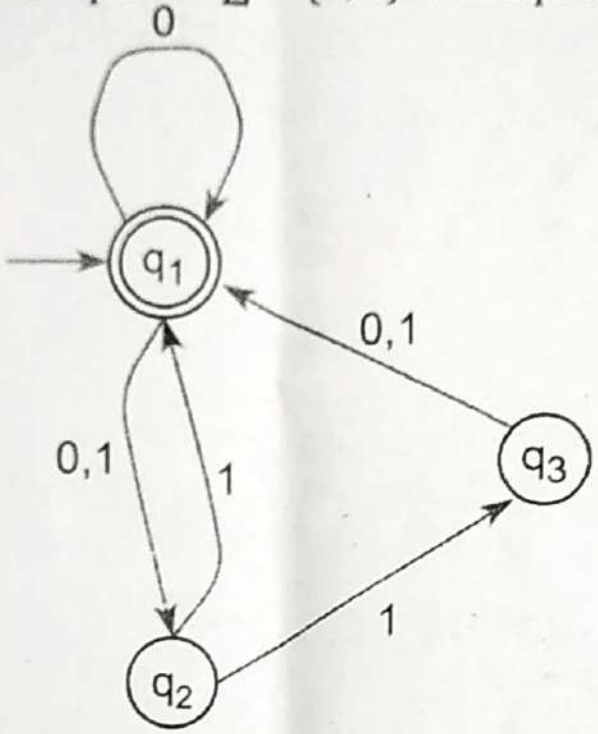
|---|---|---|
| 4. | Convert the following **NFA** over alphabet $\sum = \{0, 1\}$ to an equivalent **DFA**.   | 6 |
| 5. | Design Regular Expression for the following languages where $\sum = \{a, b\}$:<br>a. All strings $w$ having even length strings and starting with ***a*** or odd length strings starting with ***b***.<br>b. **All strings $w$ which begins and ends with *b*.**<br>c. **All strings $w$ where every *a* is followed by at least one *b*.** | 3 |