



**United International University (UIU)**  
**Dept. of Computer Science & Engineering (CSE)**

**Mid Exam Fall 2022**

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

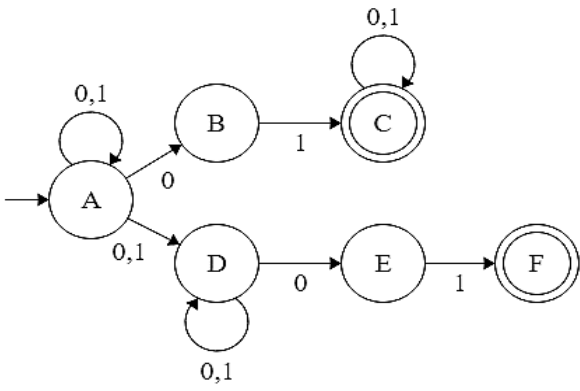
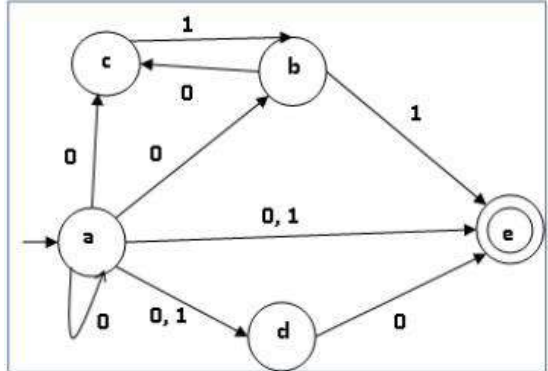
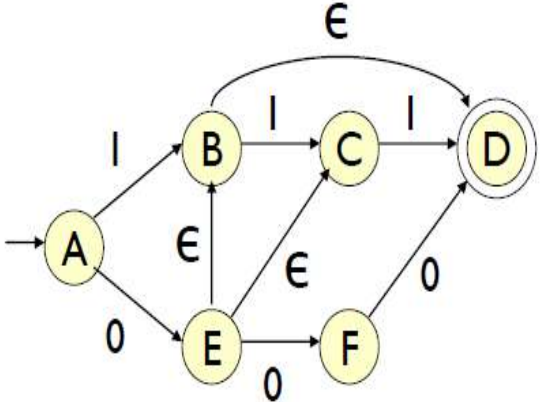
**Total Marks: 30**

**Duration: 1 Hour 45 Minutes**

**Answer all questions.** Figures 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.***

<b>1.</b>	Design DFAs that accepts the following languages: <b>a)</b> $L = \{w \mid w \text{ starts with 'ab' and contains 'bba' and ends with 'bb' } \}$ $\Sigma = \{a, b\}$  <b>b)</b> $L = \{w \mid w \text{ contains the set of all strings that has length exactly 3 and its third symbol is from the left side is 'a' } \}$ $\Sigma = \{a, b\}$  <b>c)</b> $L = \{w \mid w \text{ contains the set of all strings that has neither '00' nor '11' as substring} \}$ $\Sigma = \{0, 1, 2\}$  <b>d)</b> $L = \{w \mid w \text{ contains the set of all strings whose length always returns remainder 2 when divided by 4.} \}$ $\Sigma = \{0, 1\}$	2.5 x 4
<b>2.</b>	Design NFAs that accepts the following languages:  <b>a)</b> $L = \text{ends with 'x' and contains 'yxz' and starts with 'xy'}$ $\Sigma = \{x, y, z\}$  <b>b)</b> $L = \text{starts with 'pq' or 'qr' and contains 'pqp' or 'qrr' and ends with 'qqr'}$ $\Sigma = \{p, q, r\}$  <b>c)</b> $L = \text{starts with '211' and contains '112' or '321' and ends with '1'}$ $\Sigma = \{1, 2, 3\}$	3 x 3

3.	<p>Consider the following NFA, and show with the help of NFA-tree whether the string “11010” is accepted or not.</p> 	3
4.	<p>Convert the following NFA over alphabet <math>\Sigma = \{0, 1\}</math> to an equivalent DFA.</p> 	4
5.	<p>Convert the following <math>\epsilon</math>-NFA over alphabet <math>\Sigma = \{0, 1\}</math> to an equivalent DFA.</p> 	4