



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

Mid Exam Summer 2022

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

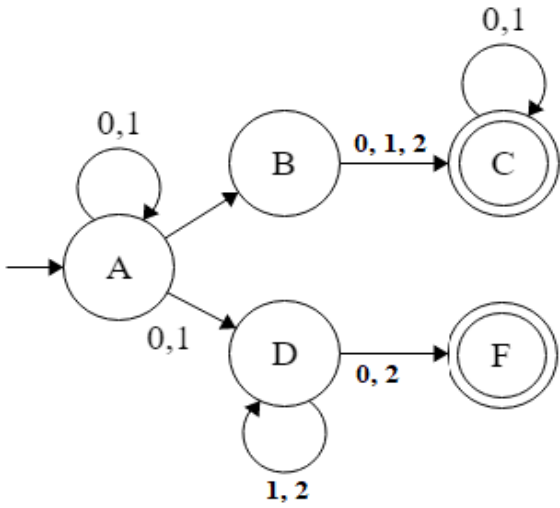
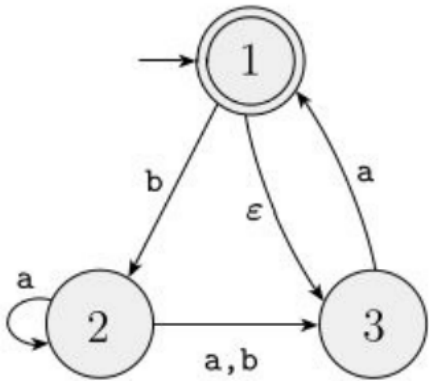
Total Marks: 30

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.

1.	<p>Design DFAs that accepts the following languages:</p> <p>a) $L = \{w \mid w \text{ starts and ends with different symbols and the length of } w \text{ is even} \mid \Sigma = \{0, 1\}$</p> <p>b) $L = \{w \mid w \text{ contains at least two 'a's and at most one 'b'} \mid \Sigma = \{a, b\}$</p> <p>c) $L = \{w \mid w \text{ contains even number of 0's or odd number of 2's.} \mid \Sigma = \{0, 1, 2\}$</p> <p>d) $L = \{w \mid w \text{ contains all the binary number which is divisible by 3 or ends with "011"} \mid \Sigma = \{0, 1\}$</p>	3 x 4
2.	<p>Design NFAs that accepts the following languages:</p> <p>a) $L = \text{ends with 'b' and contains 'bbcb' and starts with 'aacd'} \mid \Sigma = \{a, b, c, d\}$</p> <p>b) $L = \text{contains 'bba' or 'abb' or 'acc' and starts with 'ab' or 'bc'} \mid \Sigma = \{a, b, c\}$</p> <p>c) $L = \text{starts with '121' and contains '212' or '312' and ends with '2'} \mid \Sigma = \{1, 2, 3\}$</p>	2.5 x 3
3.	<p>Consider the following NFA, and show with the help of the NFA tree whether the string "11010" is accepted or not.</p> <div> <pre> graph LR Start(()) --> A((A)) A -- "0,1" --> A A -- "1" --> B((B)) B -- "0" --> F(((F))) F -- "1" --> A F -- "0" --> F </pre> </div>	3

4.	<p>Convert the following NFA over alphabet $\Sigma = \{0, 1, 2\}$ to an equivalent DFA.</p>  <pre> graph LR A((A)) -- "0,1" --> A A -- "0,1" --> B((B)) A -- "0,1" --> D((D)) B -- "0,1,2" --> C(((C))) C -- "0,1" --> C D -- "1,2" --> D D -- "0,2" --> F(((F))) style A fill:#fff,stroke:#000 style B fill:#fff,stroke:#000 style C fill:#fff,stroke:#000,stroke-width:2px style D fill:#fff,stroke:#000 style E fill:#fff,stroke:#000 style F fill:#fff,stroke:#000,stroke-width:2px </pre>	4.5
5.	<p>Convert the following ϵ-NFA over alphabet $\Sigma = \{a, b\}$ to an equivalent DFA.</p>  <pre> graph TD 1(((1))) -- "b" --> 2((2)) 1 -- "epsilon" --> 3((3)) 2 -- "a" --> 1 2 -- "a,b" --> 3 3 -- "a" --> 1 style 1 fill:#fff,stroke:#000,stroke-width:2px style 2 fill:#fff,stroke:#000 style 3 fill:#fff,stroke:#000 </pre>	3