United International University (UIU)

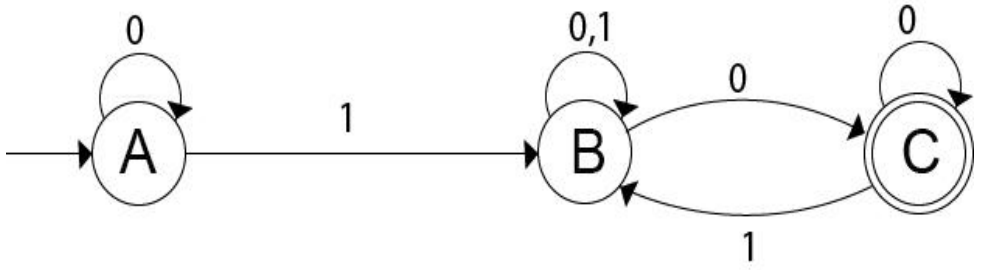
Dept. of Computer Science & Engineering (CSE)

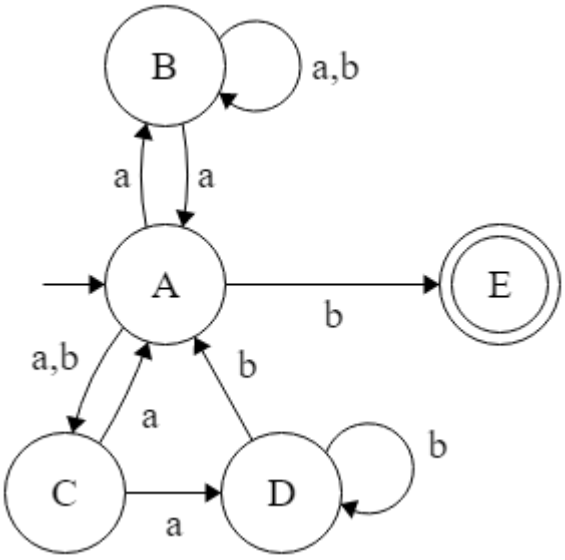
Mid Exam Spring 2022.

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

Total Marks: **30** Duration: 105 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.**

1.	Design DFAs that accepts the following languages: **a)** L= starts with '0' *and* contains '110' *and* ends with '01' | $\sum$ = {0,1,2} *Sample Valid: 011001, 001101* *Sample Invalid: 111001, 0110100* **b)** L= starts with 'c' *and* contains 'abc' or 'bca' *and* ends with 'b' | $\sum$ = {a,b,c} *Sample Valid: ccabcb, cbcabb* *Sample Invalid: cabbb, abcac* **c)** L = does not contain 'xyz' *and* ends with 'yy' | $\sum$ = {x,y,z} *Sample Valid: xyy, yy* *Sample Invalid: xyzyy, xyxy*	3x3
2.	Design NFAs that accepts the following languages: **a)** L= starts *and* ends with the same symbol with total length at least 2 | $\sum$ = {0,1} *Sample Valid: 00,11,010,1010101* *Sample Invalid: 100, 0* **b)** L= contains 'xx' or 'yx' or 'zz' *and* ends with 'yz' or 'y' | $\sum$ = {x,y,z} *Sample Valid: zyxy, zxxzzy* *Sample Invalid: xyzyz, yxxz* **c)** L =starts with '0x0 *and* contains '0' or 'x' *and* ends with '0' | $\sum$ = {0,x,y} *Sample Valid: 0x0,0x0yyy0* *Sample Invalid: 0xx0, 0xy0x*	3x3
3.	Consider the following NFA, and show with the help of NFA-tree whether the string "0011001" is accepted or not.  	3

4.	Convert the following NFA over alphabet $\sum = \{a, b\}$ to an equivalent DFA.  	6
5.	Develop Regular expression over $\sum$ = {*x*,*y*,*z*} for following languages: a) Contains at least three *x* b) Number of *y* is multiple of 4 c) Even length if the string starts with *x* and Odd length if the string starts with *y* or *z*	3x1