CECS 329, LO Assessment 1, Friday Section Fall 2026, Dr. Ebert

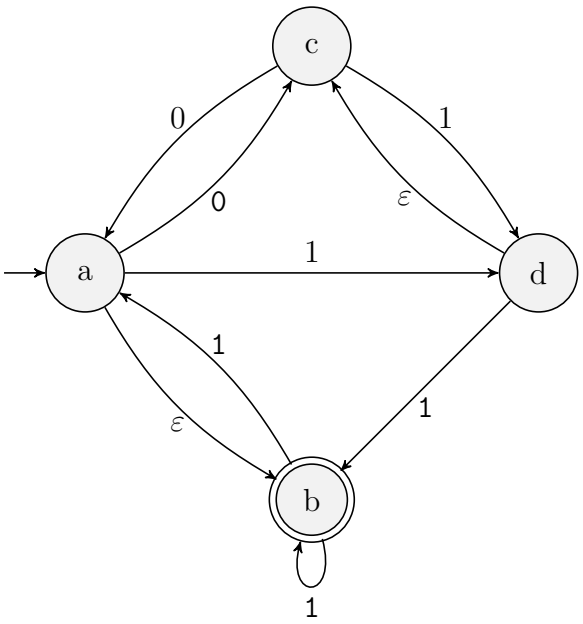
IMPORTANT: For each problem (LO1,LO2,GWK,ADV, All LO Makeups) write your solution using a **SINGLE** and **SEPARATE SHEET OF PAPER (BOTH FRONT AND BACK)**. Write your **FIRST NAME**, **ALPHABETIZING NAME** and **PROBLEM NUMBER** on each sheet.

25 Points Each

LO1 a. Provide the state diagram for a DFA M that accepts exactly those words that have an odd number of 1's, *except* for 111, which should be rejected. (19 pts)

b. Show the computation of M on i) 00100 and ii) 111. (6 pts)

LO2 Do the following for the NFA N whose state diagram is shown below.



a. Provide a table that represents N's δ transition function. (12 pts)

b. Use the table from part a to convert N to an equivalent DFA M using the method of subset states. Draw M's state diagram. (8 pts)

c. Show the computation of M on input $w = 01010$. (5 pts)

GK a. For the δ-transition function of a DFA M what are its inputs and what does it output (within the context of a computation)? How does an NFA's δ-transition function differ from that of a DFA's? (13 pts)

b. What do we call a language that is accepted by a DFA/NFA? If someone asked you "what property do all such languages have in common and that other languages do not have?" what would you tell them without referring to DFA/NFA's, states, etc., and assuming that they know something about computers and have taken a beginning programming class? (12 pts)

ADV Consider the alphabet

$$\Sigma = \left\{ \begin{matrix} 0 \\ 0 \end{matrix}, \begin{matrix} 0 \\ 1 \end{matrix}, \begin{matrix} 1 \\ 0 \end{matrix}, \begin{matrix} 1 \\ 1 \end{matrix} \right\}$$

where each symbol is a column vector of two bits. Provide the state diagram for a DFA M that accepts all words w over Σ for which the top and bottom layers of w represent binary words u and v, respectively, where v is equal to u shifted two bits to the left, with the final two bits of v filled in with 0's. Notice that, because of the shift, the first two bits of u will not appear in v. For example, the DFA should accept

$$w_1 = \begin{matrix} 010101 \\ 010100 \end{matrix}$$

However, it should reject

$$w_2 = \begin{matrix} 10001 \\ 00101 \end{matrix}$$

since the last bit of v should equal 0. Provide a description of each state of M. In other words, for each state $q \in Q$, what will be true about a word that forces M to terminate in state q? (25 pts)