

Part C: Designing DFAs [10 Points]

Let $\Sigma = \{0, 1\}$. Consider the following languages over Σ .

$$L_1 = \{w : \text{the length of } w \text{ is at most three}\}$$

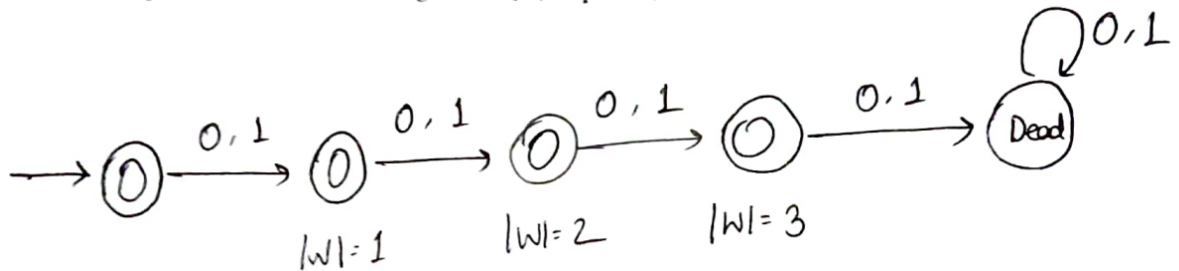
$$L_2 = \{w : 00 \text{ appears at least twice as a substring in } w\}$$

Now solve the following problems.

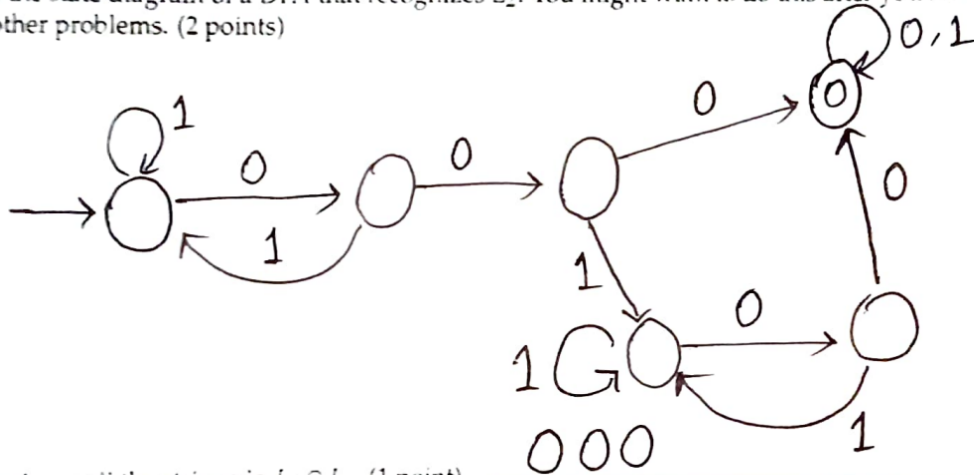
(a) Write down all the length-four strings in L_2 . (1.5 points)

0001, 1000, 0000

(b) Give the state diagram of a DFA that recognizes L_1 . (3.5 points)



(c) Give the state diagram of a DFA that recognizes L_2 . You might want to do this after you have completed all the other problems. (2 points)



(d) Write down all the strings in $L_1 \cap L_2$. (1 point)

(e) Give a five-state DFA that recognizes $L_1 \cap L_2$. Your answer to (d) should help you here. (2 points)

