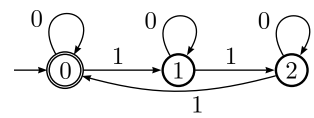
CPSC-421 **Introduction to Theory of Computing** **Fall 2004**

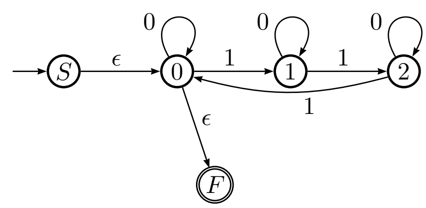
Homework 5

Question 3

(a)

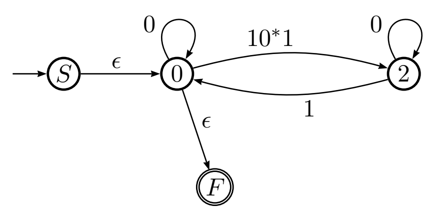


(b)

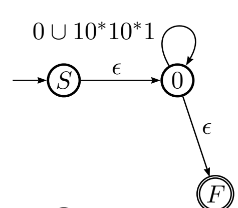


Step 1: Constructing the GNFA.

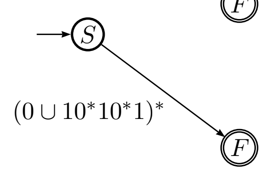
Step 2: Removing State 1.



Step 1: Removing State 2.



Step 1: Removing State 0.



The final regular expression is

$$\mathcal{R} = (0 \cup 10^*10^*1)^*$$

Question 5

(a)

The elements of $X = \{00, 01, 0, 1\}$ are pairwise distinguishable. The table below shows the appropriate z for each pair.

x_1	x_2	z
00	01	ϵ
00	0	ϵ
00	1	ϵ
01	0	01
01	1	01
0	1	0

(b)

Let M be a DFA that accepts L and has fewer than p states. So, there must be at least two strings x and y in L that end up in the same state of M. Thus, for any z, the final state for xz and yz are similar. This contradicts the fact that x and y must be distinguishable.

(c)

Let $X = \{000, 001, 010, 011, 100, 101, 110, 111\}$. We claim that X is pairwise distinguishable by L. Let x_1 and x_2 be any two strings of X. They must differ in at least one bit, say the i^{th} last character. Now, if we add $3 - i$ zeros at the end of both strings, the new strings differ in the 3^{rd} last digits. Thus, one of the new strings is in L and the other is not.

For example if $x_1 = 101$ and $x_2 = 110$, thy differ in the last digit. So, if we add 00 to the end of both strings, the new strings are 10100 and 11000 which differ in the third last digit.