CS 135 Team Homework 4. Due October 4, 10am.

Ques.1: Given a memory that is addressed using 22 bits and is 3-bit addressable, how many bits of storage does the memory contain?

Ques.2: In this question you are required to design a sequential circuit that generates an output \( Z=1 \) whenever the input binary string has an even number of 0’s and an even number of 1’s. For example, if the input string is 010010 (4 zeros and 2 ones) then the output \( Z=1 \). If the input string is 101010 (3 zeros and 3 ones) then the output is \( Z=0 \). First construct the state diagram, and then implement the circuit using D master-slave flip-flops.

Ques.3: In this question you are required to design a sequential circuit that generates an output \( Z=1 \) whenever the input substring 0101 is detected. For example, for the input sequence 00010110101 the required output would be 00000100001. (To make for a simpler circuit, assume overlapping sequences are not considered.)
First construct the state diagram. Next make a state assignment and determine the truth table (including next state). Finally, implement the circuit using either D or SR flip-flops.

Ques.4: In this question you are required to design a sequential circuit that generates an output \( Z=1 \) whenever the input binary string has an equal number of 0’s and 1’s. For example, if the input string is 01001011 (4 zeros and 4 ones) then the output \( Z=1 \). If the input string is 010010 (4 zeros but only 2 ones) then the output is \( Z=0 \). Can you construct a finite state diagram, and then implement the circuit using D master-slave flip-flops?