SECOND MID-TERM EXAM SIMULATION
30/12/2020

Exercise 1 (8 points) Given 8 registers S0, S1, S2, S3, D0, D1, D2, D3, design a circuit that enables the following transfers:

1. If the sum of the values in S0 and S1 is greater than the sum of the values in S2 and S3, then Di receives the content of Si.
2. If the sum of the values in S0 and S1 is smaller than the sum of the values in S2 and S3, then Di receives the content of $S_{(i+1) \text{ MOD } 4}$;
3. Otherwise, Di receives the minimum among the content of Si and $S_{(i+1) \text{ MOD } 4}$.

All transfers are enabled only if the content of S2 is not zero.

Exercise 2 (4+2 points) Minimize the following Mealy automaton with initial state S0:

	a	b
S0	S0/0	S1/1
S1	S4/0	S3/0
S2	S4/0	S3/1
S3	S2/0	S3/0
S4	S4/0	S1/1

Then turn the minimum automaton into the equivalent (minimum) Moore automaton.

Exercise 3 (8+4 points) By using FFs of kind JK, design a sequential net with 2 input lines x1 and x0 and one output z such that z = 1 if and only if the number of 1s received so far on the two input lines have the same parity (that is, the 1s received on x1 and on x0 are either both even or both odd)

Example: x1: 1101110101
x0: 0111011011
z: 0011001011

Then, draw the temporal diagram for the input of the previous example.

Exercise 4 (4 points) Draw an asynchronous counter modulo 5, by using JK FFs with asynchronous inputs.