ECE 27000 Spring-22
Practice Problems 10

Note: The problems below will allow you to practice the material covered in week 10. A homework will be available separately. Do not attempt to submit practice problems for grading.

Solve the following problems.

1. Write the state table of a single-input single-output machine that produces the output 1 whenever the sequence 1111 occurs. For example, if the input sequence is 01011111, the required output sequence is 00000011

2. Write the state table of a single-input single-output machine that produces an output 1 whenever the last string of five input symbols contains exactly three 1's and the string starts with two 1's. After each string that starts with two 1's, analysis of the next string will not start until the end of this string of five, whether it produces a 1 output or not. For example, if the input sequence is 11011010, the output sequence is 00000000, whereas an input sequence 10011010 produces an output sequence 00000001.

3. Write the state table of a single-input single-output machine that produces an output 1 whenever the last four input symbols correspond to a number which is a multiple of 3, i.e., 0, 3, 6, ...

4. Apply state minimization to the following state table, and find a reduced state table.

	S*,Z	
S	X=0	X=1
A	B,1	H,1
B	F,1	D,1
C	D,0	E,1
D	C,0	F,1
E	D,1	C,1
F	C,1	C,1
G	C,1	D,1
H	C,0	A,1

5. Determine whether the following two machines are equivalent, i.e., every state of one machine has an equivalent state in the other machine.
To answer this question, combine the two state tables into a single state table (this is called the direct sum of the two machines), and apply the state minimization procedure.

	S0*,Z0	
S0	X=0	X=1
A	A,0	B,1
B	A,0	C,0
C	C,0	A,1

	S1*,Z1	
S1	X=0	X=1
a	a,0	c,1
b	b,0	a,1
c	a,0	b,0

6. For the following state table, use the state assignment shown on the left, and find logic equations for a minimal sum gate-level implementation using D flip-flops.

			S*,Z	
Q0	Q1	S	X=0	X=1
0	0	A	A,0	D,1
0	1	B	A,0	C,0
1	0	C	C,0	B,0
1	1	D	C,0	A,1