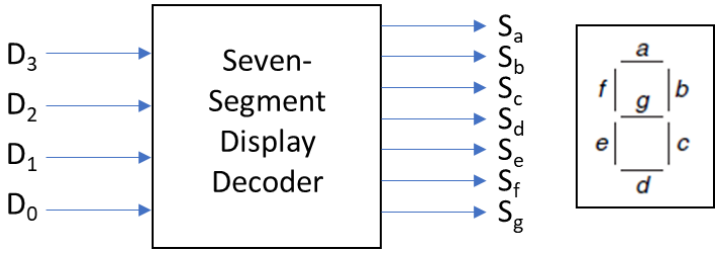
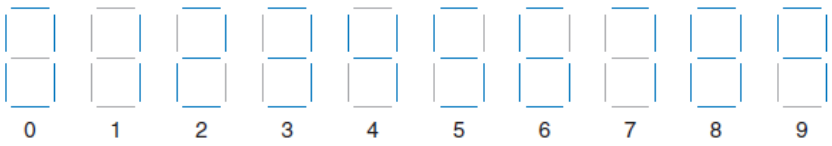
CSC 137 Cokgor Homework 1 (5 points)

A seven-segment display decoder takes a 4-bit data input D_3, D_2, D_1 and D_0 and produces seven outputs to control light-emitting diodes to display a digit from 0 to 9. The seven outputs are often called segments a through g, or S_a–S_g, as shown in the picture below.



See below for how the seven-segment display characters are formed:



The truth table for the outputs are given on page 50 of the Lecture Notes: 'Combinational Logic Small Circuits'. Study the truth tables for the outputs and understand how the inputs, D_0 to D_3, correspond to the necessary output being 1 based on how the characters are formed in the Figure above.

The K-map and the simplified Boolean equation for S_a is given on page 51 of the lecture notes as an example.

Homework Assignment:

1) Use K-maps to derive the Boolean equations for S_b , S_f and S_g. Show your K-map groupings and the Boolean equations clearly in your homework submission. (2 points)

2) Implement the logic circuits for S_a, S_b, S_f and S_g. in LogicWorks. Submit the screenshot of your LogicWorks circuit in your homework submission. Make sure the circuit is clear and legible. (2 points)

3) Simulate your LogicWorks circuit using binary switches on the inputs and binary probes for each output S_a, S_b, S_f and S_g. Set the switches so that you input 3. Take a screenshot of the outputs. Set your switches to input 6. Take a screenshot of the outputs. Set your switches to input 8. Take a screenshot of the outputs. Submit your screenshots. (1 point)