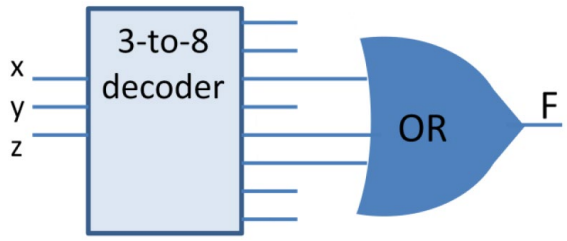
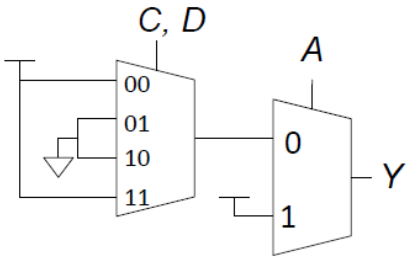
CDA 3103 Computer Organization Homework

Section I: Problems

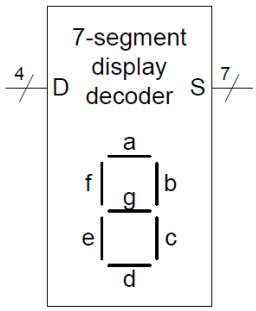
1. (15 points) Assume the output of the decoder in the following picture is ordered as 0 to 7 from top to bottom. Write the Boolean function implemented in Canonical Sum-of-Product format and Canonical Product-of-sum format.



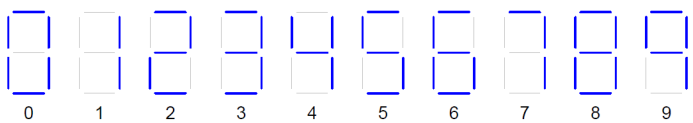
2. (10 points) Write a simplified Boolean function for the function performed by the circuit below.



3. (20 points) A seven-segment display decoder takes a 4-bit data input $D_{3:0}$ 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 defined in the following figure (a). The digits are shown in figure (b). Write a true table for the outputs, then use Boolean identities to find the simplified Boolean functions for outputs S_a and S_b. Assume that illegal input values (10-15) produce a blank readout.

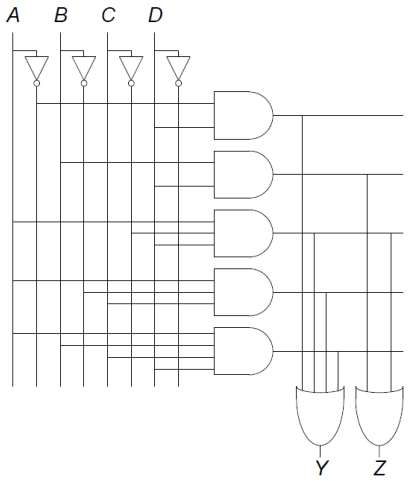


(a) Seven-segment display decoder icon

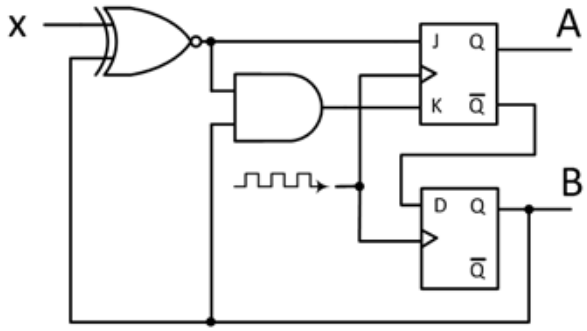


(b) Seven-segment display digits

4. (10 points) Using a 4X16 decoder module and a OR gate to implement the Boolean function $f(a,b,c,d) = abc' + acd$.
5. (10 points) Using an 8X1 multiplexer module to implement the Boolean function $f(a,b,c) = b + ac'$.
6. (10 points) Write Boolean functions for the circuit below in Canonical sum-of-product form.



7. (10 points) Simplify the Boolean functions from problem 6 and sketch an improved circuit with the same function.
8. (15 points) Complete the truth table for the following sequential circuit:



X	$Q_A(t)$	$Q_B(t)$	Next State	
			$Q_A(t+1)$	$Q_B(t+1)$

Section II: Submission Requirements

The following requirements are for electronic submission via Canvas.

- Your solutions must be in a single file with a file name yourname-module3-assignment-2.
- Upload the file by following the link where you download the homework description on Canvas.
- If scanned from hand-written copies, then the writing must be legible, or loss of credits may occur.
- Only submissions via the link on Canvas where this description is downloaded are graded. Submissions to any other locations on Canvas will be ignored.