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.

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1. (10 points) Write a simplified Boolean function for the function performed by the circuit below.



1. (20 points) A seven-segment display decoder takes a 4-bit data input D3:0 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 Sa-Sg, 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 Sa and Sb. Assume that illegal input values (10-15) produce a blank readout.



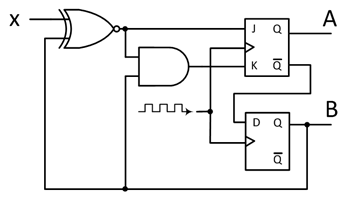
1. Seven-segment display decoder icon



1. Seven-segment display digits
2. (10 points) Using a 4X16 decoder module and a OR gate to implement the Boolean function .
3. (10 points) Using an 8X1 multiplexer module to implement the Boolean function .
4. (10 points) Write Boolean functions for the circuit below in Canonical sum-of-product form.



1. (10 points) Simplify the Boolean functions from problem 6 and sketch an improved circuit with the same function.
2. (15 points) Complete the truth table for the following sequential circuit:



|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *X* | *QA(t)* | *QB(t)* | *Next State* | |
| *QA(t+1)* | *QB(t+1)* |
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**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.