

CS 201 (David Gerhard): Introduction to Digital Systems



David Gerhard



Dashboard ► CS 201 (David Gerhard) ► Assignments ► a2

a2

Submit to urcourses, in PDF, DOC(X), or text format. PDF is preferred. Be sure to follow all assignment expectations.

Question 1:

(a) Simplify the Boolean function F together with the don't care conditions d in sum of products form. Indicate all essential prime implicants, and state which remaining prime implicant you selected.

$$F(w,x,y,z) = \sum m(0,1,3,7,8,10,13), d(w,x,y,z) = \sum m(2,4,9,15)$$

You may use the template “k-map-4.xls” provided on urcourses. You do not have to draw the circuit.

(b) Simplify the above Boolean function using product of sums, with Maxterms, instead of sum of products with minterms.

(c) Convert the product of sums from part (b) into sum of products form using Boolean simplification. Is this equivalent to what you found in part (a)? Should it be? Why or why not?

Question 2:

Design a combinational circuit with 4 inputs, A_3, A_2, A_1, A_0 ; and three outputs, X, Y, Z . The inputs represent a binary number in the range $[0..15]$, and the outputs represent characteristics of the numbers. Specifically, X should be true if the number is divisible by 3; Y should be true if the number is divisible by 4; and Z should be true if the number is divisible by 7. As an example, if the input is $A_3A_2A_1A_0 = 1100$, this represents the number 12, which is divisible by 3 and 4 but not 7, so the output should be $XYZ = 110$. Recall that 0 is divisible by any integer.

(a) Implement the circuit with AND gates, OR gates, and NOT gates. You may use the k-map template provided for your design work.

(b) Implement the circuit using only NAND gates

(c) Implement the circuit using AND, OR, NOT, and XOR gates. How much simpler is this design than the design in part (a)?

Question 3:





Show that a Full Adder is a Universal Device.

Assignment deliverables:


all files must have the indicated filenames (replace 200200000 with your student number):

- 1. Assignment file named “A2_200200000.docx” or “A2_200200000.pdf” containing your complete solution for Question 1 and Question 3, and your design process for Question 2.
- 2. Circuit file named “A2_200200000.cct” containing all your implemented circuits for Question 2. OR you may use separate circuit files named “A2a_200200000.cct”, “A2b_200200000.cct” and “A2c_200200000.cct”



Submission status



Submission status	Draft (not submitted)
Grading status	Graded
Due date	Friday, 30 September 2016, 11:55 PM
Time remaining	Assignment is overdue by: 79 days 15 hours
Last modified	Friday, 30 September 2016, 10:32 PM
File submissions	<div><div></div><div>A2_200312488.pdf</div></div> <div><div></div><div>A2aCircuit_200312488.pdf</div></div> <div><div></div><div>A2bCircuit_200312488.pdf</div></div> <div><div></div><div>A2cCirciut_200312488.pdf</div></div>
Submission comments	<div><div></div>Comments (0)</div>

Feedback


Grade	25.00 / 30.00
Graded on	Tuesday, 4 October 2016, 11:34 AM
Graded by	<div><div></div><div>Zhi Cao</div></div>

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-  Navigation
-  Administration










 **Navigation** 

Dashboard

-  Site home

UR Courses

Current course

- CS 201 (David Gerhard)
 - Participants
 - General
 - Course Information
 - Assignments
 -  a0
 -  A0-start
 -  a1
 -  **a2**
 -  Excel k-map template
 -  a3
 -  a4
 -  a5
 -  a6
 - Lecture Notes
 - Links and Resources
 - Notes on Assignment Solutions
 - Topic 6
 - Topic 7
 - Topic 8
 - Topic 9
 - Topic 10

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