CIT 5930 Module05 HW: Datapath

Due Date: Wednesday 10/2 @11:59pm

Which Lectures Should I Watch to Complete this Assignment?: Module05 Video lectures can be found on canvas under “Class Recordings” PDF files of the module lectures can be found on canvas under “Files->Module_Slides”

What textbook sections should I read to complete this assignment? 4.1 We will begin to diverge a bit from the book a 4.1 and the lecture slides for this w
Assigned Proble
From the textbo “simple processor” CPU
(Please conside

Custom P

a. For the NZP t the possible input combinations fo ually mean.Example:
b. Implement ar # to test (from the ALU), take in or the NZP tester. Implement the ‘

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From the lecture 5-37, implement the following division algorithm written in pseudocode below:

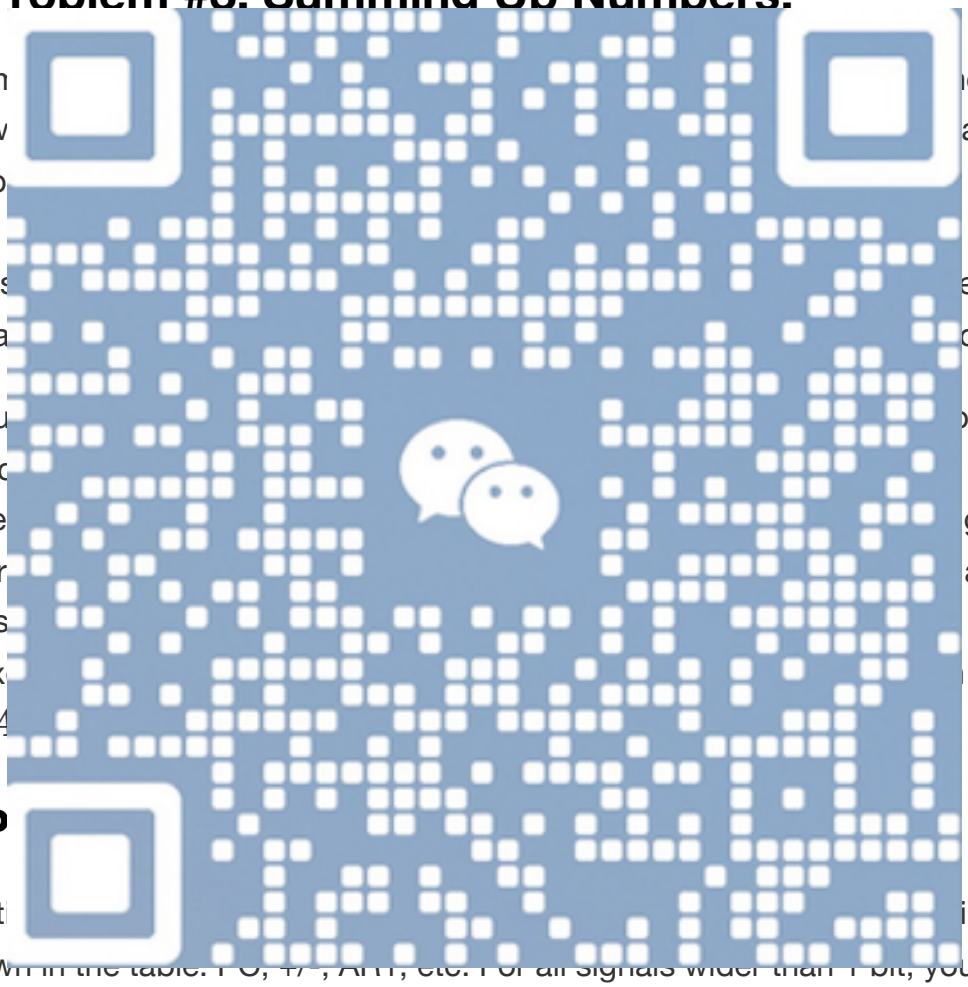
C = 0 ; // you don’t need to code this line
do { A = A – B ;
} while (A >= 0) ; C = C + 1 ;
C = C – 1 ;

NOTE: this algorithm uses a “do-while” loop. It is slightly different than a normal “while” loop. The computer will always go through the loop once, and then check the condition before it performs it again. This differs from a “while” loop that will only perform the loop IF the condition is first met.

a. Show a Flow Chart, like the one shown on slide 5-36, this will help you break the program into its

various “states.”
b. Show a table like the one shown on slide 5-41, listing the values of the control signals necessary to implement the algorithm above.
i. You may assign registers any way you like to hold your variables and necessary data, but state it up front & give their initial values.
ii. You don’t need to have instructions to set values of the registers.
c. Show an “Execution Trace” like the one shown on slide 5-43 for your program in step (b). For your trace,assume $A = 5$ and $B = 2$

Custom Problem #3: Summing Up Numbers:



For this problen ...own on slide 5-37. This time you w ...ake as input an unsigned numb ... to but not including A. As ... $2 + 3 + 4$ You may assume (as ...ed in your register file, as well as a ...our algorithm.

a. Write out you ...our algorithm.
b. Show a flowc
c. Show a table ...gnals necessary to implement your ... and you can assign the regis
d. Show an “Ex ... step (c). For your trace,assume A

Custom P

For the “execut ...ing diagram for all 12 signals shown in the table. PC, IR, ALU, etc. For all signals wider than 1 bit, you are welcome to use the abbreviated form of the multi-bit signal shown in module04 (sequential logic) slide 4-46. The next page of this assignment has the timing diagram that you must complete on it.
You need only to show the first 3 cycles of the clock from the execution trace

- These specifications may or may not be useful in the construction of the timing diagram
- The period of the clock is 10ns
- The propagation delay for reading from the register file is: 2.5ns
- The propagation delay for writing to the register file is: 3.5ns
- The propagation delay for reading from the control memory is: 1ns

- The propagation delay for the ALU is 2ns for addition
- The propagation delay for the ALU is 2.5ns for subtraction
- The propagation delay for the Test box is 0.5ns
- The propagation delay for Test MUX is 0.5ns
- The propagation delay for the incrementor box is 1.5ns
- The propagation delay for the PC register is 1.5ns o notice on the timing diagram that it took 1. ns for the $PC = 0$ after the clock went from 0 to 1 – you must account for the propagation delay of each component like this, e.g. – the ALU takes 2ns for addition

After constructing the timing diagram, answer the following:

a) Is the clock p

b) If the clock p e CPU function properly?

c) What is the fr

Directions on h rk with pencil/paper firs t (using your favorite app) an you did for the last HW).# cit593 cit