Chapter 3 Sample Questions 私立輔仁大學 -資訊工程系

Computer Organization 計算機組織 資工三甲

Assigned on: Sample **Due Date:** Sample

學生姓名：_______________學生學號：______________系 級：_________________

SAMPLE Questions to be practiced before Midterm Exam on April 24th, 2017

1. [10 points] This problem covers 4-bit binary multiplication. Fill in the table for the Product, Multplier and Multiplicand for each step. You need to provide the DESCRIPTION of the step being performed (shift left, shift right, add, no add). The value of M (Multiplicand) is 1011, Q (Multiplier) is initially 1010. (First four steps are given for your example. Write the rest of the steps and complete using the algorithm.)

Product	Multiplicand	Multiplier	Description	Step
0000 0000	0000 1011	1010	Initial Values	Step 0
0000 0000	0000 1011	1010	0 => No add	Step 1
0000 0000	0001 0110	1010	Shift left M	Step 2
0000 0000	0001 0110	0101	Shit right Q	Step 3
				Step 4
				Step 5
				Step 6
				Step 7
				Step 8
				Step 9
				Step 10
				Step 11
				Step 12
				Step 13
				Step 14
				Step 15

2. [10 points] This problem covers 4-bit binary unsigned division (similar to Fig. 3.11 in the text). Fill in the table for the Quotient, Divisor and Dividend for each step. You need to provide the DESCRIPTION of the step being performed (shift left, shift right, sub). The value of Divisor is 4 (0100, with additional 0000 bits shown for right shift), Dividend is 6 (initially loaded into the Remainder). (Few steps are given. Write the rest of the steps.)

Quotient	Divisor	Remainder	Description	Step
0000	0100 0000	00000 0110	Initial Values	Step 0
0000	0100 0000	1100 0110	Rem = Rem – Div	Step 1
0000	0100 0000	0000 0110	Rem < 0 => +Div, sll Q, Q0 = 0	Step 2
0000	0010 0000	0000 0110	Shift Div to right	Step 3
				Step 4
				Step 5
				Step 6
				Step 7
				Step 8
				Step 9
				Step 10
				Step 11
				Step 12
				Step 13
				Step 14
				Step 15

3. **(10 points)**Using 32-bit IEEE 754 single precision floating point with one(1) sign bit, eight (8) exponent bits and twenty three (23) mantissa bits, show the representation of -11/16

4. **(15 points)** Perform the following operations by converting the operands to 2's complement binary numbers and then doing the addition or subtraction shown. Please show all the work in binary, operating in 16-bit numbers. A). 13 - 2 B). 5 - 6 C). -7 – (-7)

Answer:

5. **(10 points)**Given the following bit pattern:

1010 1101 0001 0000 0000 0000 0000 0010

What does it represent, assuming that it is

a). single precision floating point number?

b). a two's complement integer?

c). An unsigned integer?

6. **[5** points] In a von Neumann architecture, groups of bits have no intrinsic meanings by themselves. What a bit pattern represents depends entirely on how it is used. The following table shows bit patterns expressed in hexadecimal notation.

0xAFBF0000

a). What decimal number does the bit pattern represent if it is a two's complement integer? b). If this bit pattern is placed into the instruction Register, what ARM instruction will be executed?

7. **(10 points)**Convert these decimal to binary and **a**dd 3.63_{ten} X 10^4 to 6.87_{ten} X 10^3, assuming that you have only three significant digits, first with guard and round digits and then without them. Convert the result back to Decimal and show your results in decimal.

8. **(5 points)**Show the IEEE 754 binary representation for the floating point number 20.5_{ten} in single precision.

9. **[5 points]**Assuming single precision IEEE 754 format, what decimal number is represent by this word:

1 01111101 00100000000000000000000

(Hint: remember to use the biased form of the exponent.)

10. [10 points]Use the number in the following expression: A=50 B= 23

Using a table similar to that shown in Figure 3.7 (Text book, page 224) or as given below, Calculate the product of the **octal** unsigned **6** bit integers A and B using the hardware described in Figure 3.4 (on page 221 in the textbook). You should show the contents of each register on each step. (Remember to use six bits unsigned)

Step	Action	Multiplier	Multiplicand	Product
0	Initial values	010 011	000 000 101 000	000 000 000 000
1				
1				
2				
3				
4				
5				
6				

11. [10 points] We will use the **octal** numbers as follows for the question below

A = 50; B=23

Using a table similar to that shown in Figure 3.11, (on page 229, on the textbook) calculate A divided by B using the hardware described in Figure 3.9 (on page 227). You should show the contents of each register on each step. Assume A and B are unsigned **6-bit** itegers.

Iteration	Step	Quotient	Divisor	Remainder
0	Initial Values			
1				
2				
3				
4				
5				

6				
7				

12. What is 4365 – 3412 when these values represent signed 12-bit octal numbers stored in sign-magnitude format? The result should be written in Octal. Show your work.
13. Assume 185 and 122 are unsigned 8-bit decimal integers. Calculate 185 -122. Is there an overflow, underflow, or neither?
14. Assume 185 and 122 are signed 8-bit decimal integers stored in sign-magnitude format. Calculate 185 -122. Is there an overflow, underflow, or neither?
15.Assume 151 and 214 are signed 8-bit decimal integers stored in two's complement format. Calculate 151 + 214 using saturating arithmetic. The result should be written in decimal. Show your work.
16. Assume 151 and 214 are signed 8-bit decimal integers stored in two's complement format. Calculate 151 - 214 using saturating arithmetic. The result should be written in decimal. Show your work.
17. Assume 151 and 214 are unsigned 8-bit decimal integers stored in two's complement format. Calculate 151 + 214 using saturating arithmetic. The result should be written in decimal. Show your work.
18. Using the table shown in question 1, calculate the product of the octal unsigned 6-bit integers 62 and 12 using the hardware described in Figure 3.3 in the text book. You should show the contents of each register on each step.