IN1006 Systems Architecture (PRD1 A 2022/23)

Started on	Thursday, 10 November 2022, 5:03 PM
State	Finished
Completed on	Thursday, 10 November 2022, 5:09 PM
Time taken	5 mins 26 secs
Grade	10.00 out of 10.00 (100%)

Question 1

Correct

Mark 1.00 out of 1.00

What is the equivalent decimal number of the binary number 10000001 written in 2's complement?

Select one:

- a. Don't know/no answer
- b. -127 ✔
- c. -128
- d. 1
- e. 130
- f. 129

In 2's complement we do:

10000001

01111110 (flip the bits)

0000001 (add 1)

01111111, the decimal value is: 127

But, the MSB of the original number is 1 so, this is a negative number:

-127

The correct answer is: -127

Question 2

Correct

Mark 1.00 out of 1.00

What is the correct result of the operation below? The initial numbers should be considered as unsigned integers. The result should be given in 2's complement. (Hint: use 2's complement arithmetic to perform the operation.)

00010101 - 00001111

Select one:

- a. 00000110 ✔
- b. 00011001
- c. 10100101
- d. 11111010
- e. 11101010
- f. Don't know/no answer

To perform the subtraction we find the negative of the subtrahend:

00001111 (subtrahend)

11110000 (1's complement, flip one bit)

00000001 (add 1)

11110001 (2's complement of the subtrahend)

perform the addition:

00010101

11110001 +

00000110 (this is the result in 2's complement or 6 in decimal) (no overflow has occurred because the carry in equals the carry out of the sign bit)

The correct answer is: 00000110

Question 3

Correct

Mark 1.00 out of 1.00

What are the binary and decimal representations of the hexadecimal number F4?

Select one:

- a. Binary: 11110100 Decimal: 244 ✔
- b. Binary: 11110010 Decimal: 244
- c. Binary: 11100100 Decimal: 244
- d. Don't know/No answer
- e. Binary: 11110100 Decimal: 240

Your answer is correct.

To convert from base 16, we remember that $F4_h$ means

F x 16^1 + 4 x 16^0

15 x 16 + 4 x 1

240 + 4

244_{10}

The correct answer is: Binary: 11110100 Decimal: 244

Question 4

Correct

Mark 1.00 out of 1.00

What is the correct hexadecimal representation for the binary number 01011101? All answers below are given in hexadecimal representation and we omit the (h) subscript.

Select one:

- a. 5D ✔
- b. 4D
- c. 5C
- d. D5
- e. Don't know/no answer
- f. 5E

The most straightforward approach is to consider the binary word four bits at a time as shown in the table.

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Binary	0101	1101
Hexadecimal	5	D

The correct answer is: 5D

Question 5

Correct

Mark 1.00 out of 1.00

What is the equivalent decimal number of the binary number 10000001 which is written in signed magnitude?

Select one:

- a. -127
- b. -128
- c. 129
- d. Don't know/no answer
- e. -1 ✔
- f. 1

The MSB is "1" so this is a negative number.

The next 7 bits correspond to the magnitude: 1

So, -1

The correct answer is: -1

Question 6

Correct

Mark 1.00 out of 1.00

Which of the following 8-bit binary numbers represents number 77 in the decimal system (select one answer)?

- a. 1 1 0 0 1 1 0 1
- b. 0 1 1 0 1 1 0 0
- c. 1 1 1 0 1 0 1 0
- d. 0 1 0 0 1 1 0 1 ✔ Correct answer.
- e. None of the rest of the choices

Your answer is correct.

The correct answer is:

0 1 0 0 1 1 0 1

Question 7

Correct

Mark 1.00 out of 1.00

What is the numeric range of an 8-bit signed magnitude binary number?

Select one:

- a. 0...7
- b. Don't know/no answer
- c. -128 ... 127
- d. -127...127 ✔
- e. -255...256
- f. 0...255

We represent the negative values in the range -127 through -1 and the positive values in the range 0 through 127 with a single 8-bit byte.

The correct answer is: -127...127

Question 8

Correct

Mark 3.00 out of 3.00

Which of the following binary numbers corresponds to the result of the following subtraction of hexadecimal numbers (hint: transform the hexadecimal numbers to binary and perform subtraction as addition of the 2's complement the number to be subtracted):

82_{hex} - 78_{hex}

- a. 0000 1010 ✔ Correct answer.
- b. 1111 1001
- c. 1010 1010
- d. 0000 1001
- e. 0010 1001

Your answer is correct.

The binary form of 82_{hex} is: 1000 0010

The binary form of 78_{hex} is: 0111 1000

Subtracting 78_{hex} from 82_{hex} can be carried out by adding the 2's complement of 78_{hex} to 82_{hex}.

To find the 2's complement of 78_{hex} we first flip the bits of its binary representation. This gives us: 1000 0111 (flip bits)

And then we add 1, so we get:

1000 0111

\+ 1

This gives us:

1000 1000 (i.e., the 2's complement of 78_{hex})

Then we perform the addition:

1000 0010 (82_{hex})

\+ 1100 0111 (i.e., the 2's complement of 78_{hex})

The result of this addition is

0000 1010

and as the left most bit is 0 the number is a positive one and therefore it constitutes the answer.

The correct answer is:
0000 1010

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