IN1006 Systems Architecture (PRD1 A 2022/23)

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State	Finished
Completed on	Thursday, 10 November 2022, 4:43 PM
Time taken	5 mins 48 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. -128
- b. 129
- c. -127 ✔
- d. 1
- e. Don't know/no answer
- f. 130

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.)

00001111 - 00010101

Select one:

- a. 00000101
- b. 11101011
- c. 11101010
- d. 00000110
- e. 11111010 ✔
- f. Don't know/no answer

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

00010101 (subtrahend)

11101010 (1's complement, flip one bit)

00000001 (add 1)

11101011 (2's complement of the subtrahend)

perform the addition:

00001111

11101011 +

11111010 (this is the result in 2's complement or -6 in decimal

The correct answer is: 11111010

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

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

Select one:

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

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 **5**

Correct

Mark 1.00 out of 1.00

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

Select one:

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

We represent the values in the range 0 through 255 with an unsigned 8-bit byte.

The correct answer is: 0 ... 255

Question **6**

Correct

Mark 1.00 out of 1.00

What is the correct hexadecimal representation for the binary number 11110110? You do not need to give the subscript (h). All possible answers below are in hexadecimal representation.

Select one:

- a. E6
- b. 87
- c. Don't know/no answer
- d. F6 ✔
- e. D6
- f. F1

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

Binary	1111	0110
Hexadecimal	F	6

The correct answer is: F6

Question **7**

Correct

Mark 1.00 out of 1.00

Which of the following numbers is the octal number representing number 20 in the decimal system (select one answer)?

- a. 66
- b. 44
- c. 10
- d. 16
- e. 24 ✔ Correct.

Your answer is correct.

The correct answer is:
24

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):

$A1_{hex}$ - 92_{hex}

a. 0001 1111

b. 0000 1111 ✔ This is the correct answer.

c. 0000 0111

d. 0111 1011

e. 0110 1100

Your answer is correct.

The binary form of $A1_{hex}$ is: 1010 0001

The binary form of 92_{hex} is: 1001 0010

Subtracting 92_{hex} from $A1_{hex}$ can be carried out by additing the 2's complement of 92_{hex} to $A1_{hex}$.

To find the complement of 92_{hex} we first flip the bits of its binary representation. This gives us: 0110 1101 (flip bits)

And then we add 1, so we get:

0110 1101

\+ 1

This gives us:

0110 1110 (i.e., the 2's complement of 92_{hex})

Then we perform the addition:

1010 0001 $A1_{hex}$

0110 1110 (addition of 2's complement of 92_{hex})

The result of this addition is

0000 1111

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 1111

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