

IN1006 Systems Architecture (PRD1 A 2022/23)

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Started on Thursday, 10 November 2022, 3:17 PM

State Finished

Completed on Thursday, 10 November 2022, 3:30 PM

Time taken 13 mins 4 secs

Grade 8.90 out of 10.00 (89%)

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



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 numeric range of an 8-bit binary number in 2's complement arithmetic?

Select one:

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



We represent the negative values in the range -128 through -1 and the positive values in the range 0 through 127 with a single 8-bit byte, so -128 ... 127.

The correct answer is: -128 ...127

Question 3

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



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 **4**

Correct

Mark 1.00 out of 1.00

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

Select one:

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



Your answer is correct.

To convert from base 16, we remember that F4_h means

$F \times 16^1 + 4 \times 16^0$

$15 \times 16 + 4 \times 1$

$240 + 4$

244_{10}

The correct answer is: Binary: 11110100 Decimal: 244

Question **5**

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



Your answer is correct.

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 **6**

Correct

Mark 1.00 out of 1.00

In performing a bit-wise addition of the following unsigned binary numbers, how many "carry out" bits will be generated?

1 0 0 0 1 0 1 1

0 1 1 1 0 0 0 1

- ☐ a. 1 "carried out" bits will be produced.
- ☐ b. 3 "carried out" bits will be produced.
- ☐ c. 4 "carried out" bits will be produced.
- ☐ d. 0 "carried out" bits will be produced.
- ☒ e. 2 "carried out" bits will be produced.

✓ Correct. The two carry out bits will be produced when adding two right most pairs of bits of the given numbers.

Your answer is correct.

The correct answer is:

2 "carried out" bits will be produced.

Question 7

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):

$$49_{\text{hex}} - 22_{\text{hex}}$$

- ☐ a. 1111 0010
- ☐ b. 0010 1111
- ☐ c. 0001 1001
- ☐ d. 0010 0100
- ☒ e. 0010 0111

✓ Correct answer.

Your answer is correct.

The binary form of 49_{hex} is: 0100 1001

The binary form of 22_{hex} is: 0010 0010

Subtracting 22_{hex} from 49_{hex} can be carried out by adding the 2's complement of 22_{hex} to 49_{hex} .

To find the 2's complement of 22_{hex} we first flip the bits of its binary representation. This gives us: 1101 1101 (flip bits)

And then we add 1, so we get:

1101 1101

+ 1

This gives us:

1101 1110 (i.e., the 2's complement of 22_{hex})

Then we perform the addition:

0100 1001 (49_{hex})

+ 1101 1110 (i.e., the 2's complement of 22_{hex})

The result of this addition is

0010 0111

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

The correct answer is:

0010 0111

Question **8**

Incorrect

Mark -0.10 out of 1.00

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

Select one:

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

✖ This is wrong

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

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