

# IN1006 Systems Architecture (PRD1 A 2022/23)

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**Started on** Thursday, 10 November 2022, 4:00 PM

**State** Finished

**Completed on** Thursday, 10 November 2022, 4:05 PM

**Time taken** 5 mins 23 secs

**Grade** 10.00 out of 10.00 (100%)

## Question 1

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. Binary: 11110100    Decimal: 240
- ☐ e. Don't know/No answer



To convert from base 16, we remember that  $F4_{16}$  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

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):

$$AE_{\text{hex}} - 9F_{\text{hex}}$$

- ☐ a. 0101 0101
- ☐ b. 0110 0100
- ☒ c. 0000 1111
- ☐ d. 0000 0001
- ☐ e. 0000 0101

✓ This is the correct answer.

Your answer is correct.

The binary form of  $AE_{\text{hex}}$  is: 1010 1110

The binary form of  $9F_{\text{hex}}$  is: 1001 1111

Subtracting 9F from AE can be carried out by finding the 2's complement of  $9F_{\text{hex}}$  to  $AE_{\text{hex}}$ .

To find the complement of  $9F_{\text{hex}}$  we first flip the bits of its binary representation. This gives us: 0110 0000 (flip bits)

And then we add 1, so we get:

0110 0000

+        1

This gives us:

0110 0001 (i.e., the 2's complement of  $9F_{\text{hex}}$ )

Then we perform the addition:

1 0 1 0 1 1 1 0  $AE_{\text{hex}}$

0 1 1 0 0 0 0 1 (addition of 2's complement of  $9F_{\text{hex}}$ )

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

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



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

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. 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.

☐ b. 0 "carried out" bits will be produced.

☐ c. 4 "carried out" bits will be produced.

☐ d. 1 "carried out" bits will be produced.

☐ e. 3 "carried out" bits will be produced.

Your answer is correct.

The correct answer is:

2 "carried out" bits will be produced.

#### Question 5

Correct

Mark 1.00 out of 1.00

Which of the following numbers is the binary number representing 15 in the decimal system (select one answer)?

☐ a. 0 0 0 1 1 1 1 1

☒ b. 0 0 0 0 1 1 1 1

✓ Correct.

☐ c. 0 0 0 0 0 0 0 0

☐ d. 1 1 0 0 1 1 1 1

☐ e. None of the rest of the choices

Your answer is correct.

The correct answer is:

0 0 0 0 1 1 1 1

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



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

Binary	0101	1101
Hexadecimal	5	D

The correct answer is: 5D

#### Question 7

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?

0 1 0 0 1 0 1 1

0 0 1 0 1 0 0 1

- ☐ a. 5 "carried out" bits will be produced.
- ☒ b. 3 "carried out" bits will be produced.
- ☐ c. 0 "carried out" bits will be produced.
- ☐ d. 1 "carried out" bits will be produced.
- ☐ e. 4 "carried out" bits will be produced.



Correct. The three carry out bits will be produced when adding first, second and fourth pairs of bits of the given numbers from the right.

Your answer is correct.

The correct answer is:

3 "carried out" bits will be produced.

What is the numeric range of an 4-bit signed magnitude binary number?

Select one:

- ☐ a. 0...255
- ☐ b. 0...7
- ☐ c. -255...256
- ☐ d. -127...127
- ☐ e. -128 ... 127
- ☒ f. None of the listed options.



Your answer is correct.

The correct answer is: None of the listed options.

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