Name:_____

Written exam Computer System Architecture

09.02.2023, 10:00 – *working time 2h*

1. Fill the blanks:

a) Complete the "?" with the correct instruction/value such that at the end of the execution in **AX** register will be the value of the **last word (1a2b)** from string S (considering that S can have different number of elements). Explain. *(0.5p)*

```
segment data use32 class=data
   S dd 1234h, 4567h, 1a2bh
   lS equ ($-S)/2

; our code starts here
segment code use32 class=code
    start:
        ?
        mov esi, ?
        add esi, ?
        LODSW
```

b) After the next code lines are executed, which is the value from **BX** register? Explain. *(0.5p)*

```
segment data use32 class=data
    a dw -2, 1010b, 0BCDh, 0, -1
segment code use32 class=code
    start:
        mov ESI, a
        cld
        lodsb
        lodsw
        lodsw
        mov BX, AX
```

c) Next code lines are executed. Choose the correct value for **DX** register. Explain why. *(0.5p)*

```
segment code use32 class=code
    start:
        mov DX,0
        mov AL, -1
        clc
        mov CX, -1
        somecomputations:
            shl AL, 1
            inc CX
            cmp AL, 0
        jne somecomputations
        mov DX, CX
```

DX = 4 DX = 5 DX = 6 DX = 7 DX = 8 DX = 9 DX = 10 DX = 11

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2. Write the code sequence that computes, in the **signed interpretation**, the expression: **m * 9 - n / 7 + p**, having the following data types: **p - quadword, n - word, m - byte**. Comment the source code. *(2.5 p)*

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3. A string of doublewords T is given. Write the code to compute string R containing only high bytes from high words from each doubleword from string S. If S = 12345678h, 1a2b3c4dh then D = 12h, 1ah *(2.5 p)*

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4. Draw the content of memory (the memory representation - the hex dump content from Olly Debugger) for the following data segment and code segment. *(2.5 p)*

```
segment data use32 class=data
    a db 1
    b dw 1
    c dd 1
    d dq 1
    e db -10
    f dw -10
    g dd -10
    h dq -10
    i db '12-10'
    j dw 5Bh
    k dd 0ACDh
    m resb 2
    n db 10, 0101b, 10h
    l equ $-n
    o db 'winter'
    p dw 0, 0
    x dw 0
    y dd 0

segment code use32 class=code
    start:
     mov ax, word [d+1]; ax = ?
     mov word[x], ax
     movsx ebx, byte[e]; ebx = ?
     mov dword[y], ebx
     mov eax, 0
     mov ax, word[f]
     cwd; ax-> ?
     mov esi, n
     mov edi, m
     cld
     lodsb
     lodsw
     stosw
```