CPSC 240: Computer Organization and Assembly Language

Assignment 02, Fall Semester 2023

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1. Download the “CPSC-240 Assignment02.docx” document.
2. Design the "addition.asm" program, and use assembly language to realize the function of the following C++ instructions.  
    unsigned short num1 = 50000;  
    unsigned short num2 = 40000;  
    unsigned int sum = 0;  
    sum = int(num1 + num2);
3. Assemble the "addition.asm" file and link the "addition.o" file to get the "addition" executable file.
4. Run the "addition" file with the DDD debugger to display the simulation results of num1 and num2, as well as the simulation results of sum.
5. Insert source code (addition.asm) and simulation results (DDD debugger window) of the memory (num1, num2, and sum) in the document. Use calculator or hand calculation to verify the simulation results.
6. Design the "subtraction.asm" program, and use assembly language to realize the function of the following C++ instructions.  
    signed short num1 = 20000;  
    signed short num2 = 30000;  
    signed int dif = 0;  
    dif = int(num1 - num2);
7. Assemble the "subtraction.asm" file and link the "subtraction.o" file to get the "subtraction" executable file.
8. Run the "subtraction" file with the DDD debugger to display the simulation results of num1 and num2, as well as the simulation results of diff.
9. Insert source code (subtraction.asm) and simulation results (DDD debugger window) of the memory (num1, num2, and dif) in the document. Use calculator or hand calculation to verify the simulation results.
10. Save the file in pdf format and submit the pdf file to Canvas before 23:59 pm on 09/13/2023.

[Insert addition.asm here]

; addition.asm

; unsigned short num1 = 50000;

; unsigned short num2 = 40000;

; unsigned int sum = 0;

; sum = int(num1 + num2);

section .data

    num1 dw 50000

    num2 dw 40000

    sum  dd 0

section .text

    global \_start

\_start:

    mov dx, 0

    mov ax, word[num1]          ;al = num1 = 64h

    add ax, word[num2]          ;al = al + num2 = 2Ch

    adc dx, 0               ;ah = ah + 0 + CF = 01h

    mov word[sum+0], ax         ;sum = al = 9ch

    mov word[sum+2], dx         ;sum = ah = 0ffh

                        ;mov word[sum], ax

    Mov rax, 60             ;terminate excuting process

    mov rdi, 0              ;exit status

    syscall

[Insert addition simulation result here]

A screenshot of a computer

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[Insert addition simulation result verification here]

A calculator with a screen

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[Insert subtraction.asm here]

; subtraction.asm

; signed short num1 = 20000;

; signed short num2 = 30000;

; signed int dif = 0;

; dif = int(num1 - num2)

section .data

    num1    dw  20000

    num2    dw      30000

    dif     dd      0

section .text

    global \_start

\_start:

    mov ax, word[num1]

    sub ax, word[num2]

    sbb dx, 0

    mov     word[dif + 0], ax

    mov     word[dif + 2], dx

    mov rax, 60

    mov rdi, 0

    syscall

[Insert subtraction simulation result here]

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[Insert subtraction simulation result verification here]

A calculator with a screen

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