**Debug**

Objective : To understand the machine operation

Tools : Microsoft Visual Studio

**Part I**

1. Write the program below and examine the register contents of **eax, ebx, ecx** and **edx** for each step (Press F10: Step Over).

a) mov cl, 42

mov dl, 29

add cl, dl

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Command** | **EAX** | **EBX** | **ECX** | **EDX** |
| mov cl, 42 | 750F3378 | 7EFDE000 | 0000002A | 00C71005 |
| mov dl, 29 | 750F3378 | 7EFDE000 | 0000002A | 00C7101D |
| add cl, dl | 750F3378 | 7EFDE000 | 00000047 | 00C7101D |

b) mov ax,0123

add ax,0025

mov bx,ax

add bx,ax

mov cx,bx

sub cx,ax

sub ax,ax

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Command** | **EAX** | **EBX** | **ECX** | **EDX** |
| mov ax,0123 | BF6E007B | 00B43000 | 01081005 | 01081005 |
| add ax,0025 | BF6E0094 | 00B43000 | 01081005 | 01081005 |
| mov bx,ax | BF6E0094 | 00B40094 | 01081005 | 01081005 |
| add bx,ax | BF6E0094 | 00B40128 | 01081005 | 01081005 |
| mov cx,bx | BF6E0094 | 00B40128 | 01080128 | 01081005 |
| sub cx,ax | BF6E0094 | 00B40128 | 01080094 | 01081005 |
| sub ax,ax | BF6E0000 | 00B40128 | 01080094 | 01081005 |

1. To obtain the memory address that stores the executing command, examine the register contents of **EIP.**

Write the following program and list the memory addresses that stores each line of codes. (HINT: disassembly)

mov ax, 56h    EIP 009E1014

mov bx, 02h    EIP 009E1018

mul bx         EIP 009E101B

1. Disassembly the following machine code to assembly code/symbolic code:

a) B8 54 01 05 25 00

     mov eax,25050154h

     add ah,cl

b) B8 05 1B 00 2C EB F8

mov eax,2C001B05h

jmp \_ExitProcess@4+6h (02E101Eh)

4. Consider the machine language instructions

B0 1C D0 E0 B3 12 F6 E3 EB F6

Which instruction performs the following operations?

* 1. Move hex value 1C to the AL register.       mov al,1ch
  2. Shift the contents of AL one bit to the left.       shl al,1
  3. Move the hex value 12 to BL.       mov b1,12h
  4. Multiply AL by BL.        mul al,bl

Trace the program and find out the final product in AX? Confirm the result by manual calculation.

5. What is the output in AX?

MOV AL, 5 ; AL = multiplicand

AX = 3305

MOV BL, 10 ; BL = multiplier (operand)

AX = 3305

MUL BL

AX = 0032

6. What is the output in AX and DX?

MOV AX, 0083 ; dividend

AX = 0053  DX = 1005

MOV BL, 2 ; divisor (8 bits)

AX = 0053  DX = 1005

DIV BL

AX = 0129  DX = 1005

**Part II**

1. Enter the following instructions:

MOV AX, 0010

MOV BX, 0020

MOV CX, 0030

ADD AX, BX

INC BX

SUB CX, AX

DEC CX

What is the content of register AX, BX, CX and IP for each instruction?

Value of registers

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | **AX** | **BX** | **CX** |
| MOV | AX,010 | 000A | E000 | 0000 |
| MOV | BX,020 | 000A | 0014 | 0000 |
| MOV | CX,030 | 000A | 0014 | 001E |
| ADD | AX,BX | 001E | 0014 | 001E |
| INC | BX | 001E | 0015 | 001E |
| SUB | CX,AX | 001E | 0015 | 0000 |
| DEC | CX | 001E | 0015 | FFFF |
|  |  |  |  |  |

What is the value in decimal for CX register?

65535

1. What is the final value of AX and BX?

MOV CX,3 ;Initialize for 3 loops

L1: MOV AX,00

MOV BX,00

ADD BX,AX

LOOP L1 ;Decrement CX ;Repeat if nonzero

|  |  |  |
| --- | --- | --- |
| **AX** | **BX** | **CX** |
| 7E80 | F000 | 0003 |
| 0000 | F000 | 0003 |
| 0000 | 0000 | 0003 |
| 0000 | 0000 | 0003 |
| 0000 | 0000 | 0002 |
| 0000 | 0000 | 0002 |
| 0000 | 0000 | 0002 |
| 0000 | 0000 | 0002 |
| 0000 | 0000 | 0001 |
| 0000 | 0000 | 0001 |