

CS 271 Computer Architecture and Assembly Language

Self-Check for Lecture#17

Solutions

1. Suppose that a program's data and executable code require 2048 bytes of memory. A new section of code must be added; it will be used with various values 30 times during the execution of a program. When implemented as a macro, the macro code requires 48 bytes of memory. When implemented as a procedure, the procedure code requires 128 bytes (including parameter-passing, etc.), and each procedure call requires 5 bytes.

How many bytes of memory will the entire program require if the new code is added as a macro?

3488 Bytes

How many bytes of memory will the entire program require if the new code is added as a procedure?

2326 Bytes

2. A) Write a MASM macro that calculates x^2-1 for its parameter x , and stores the result in memory at the second parameter. The caller passes x by value, and the result variable by address.

```
PlusMinus MACRO      x, addr
    push eax
    push ebx          ; save registers
    push edi
    mov  eax,x
    mov  ebx,eax
    mul  ebx          ; x * x in eax
    dec  eax          ; x * x - 1 in eax
    mov  edi,addr
    mov  [edi],eax    ; save eax in memory address (edi)
    pop  edi
    pop  ebx          ; restore registers
    pop  eax
ENDM
```

- B) Invoke the macro of part A) with 68 and memory location result.

PlusMinus 68,OFFSET result

3. The code below uses the Space macro which simply displays the number of blank spaces specified by its argument. What output is generated by this MASM "program"?

```
main PROC
    push 3
    push 7
    call rcrsn
    exit
main ENDP

rcrsn PROC
    push ebp
    mov  ebp,esp
    mov  eax,[ebp + 12]
    mov  ebx,[ebp+8]
    cmp  eax,ebx
    jl   recurse
    jmp  quit
recurse:
    inc  eax
    push eax
    push ebx
    call rcrsn
    mov  eax,[ebp + 12]
    call WriteDec
    Space 2
quit:
    pop  ebp
    ret  8
rcrsn ENDP
```

6 __ 5 __ 4 __ 3 __

Note that no output is produced until the recursion starts to "unwind".