**Assembly Language – Integer Arithmetic (1)**

7-1 Shift and Rotate Instructions, Multiplication and Division Instructions

Objective: Understanding the rotate instructions and the “MUL” instruction, and “IMUL” instruction.

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| .data a. Based on code in the left,  myArray BYTE 33, 3, 17  myArray\_v2 WORD 256 What are the register values at L1?  .code the registers values at L1 are:   |  |  |  |  |  | | --- | --- | --- | --- | --- | | main PROC | EAX | 00000021h | EBP | 0018ff94h | | movzx eax, myArray[0] | EBX | 00000003h | ESP | 0018ff8ch | | movzx ebx, myArray[1] | ECX | 00000000h | ESI | 00000000h | |  | EDX | 00400100h | EDI | 00000000h |   b. What are the register values  when the program run each steps at L1   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | BX | | BL(bit) | CF | |  | BH | BL | | L1: | 00h | 03h | 00000011b | 0 | | ror bl, 3 | 00h | 60h | 0110 0000b | 0 | | or bl, 110b | 00h | 66h | 0110 0110b | 0 | | ror bl, 2 | 00h | 99h | 1001 1001b | 1 | | mov bl, 10h | 00h | 10h | 0001 0000b | 1 |   c. What are the register values  when the program run each steps at L2?   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | |  | DX | AX | | BX | | CF | |  | AH | AL | BH | BL | | L2: | 0100h | 00h | 21h | 00h | 10h | 0 | | mul bl ;ax=Product | 0100h | 02h | 10h | 00h | 10h | 1 | | mov bx, myArray\_v2[0] | 0100h | 02h | 10h | 01h | 00h | 1 | | mul bx ;dx:ax=Product | 0002h | 10h | 00h | 01h | 00h | 1 |   L3:  exit  main ENDP  END main |

(2)

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| .code  main PROC  What are the register values at each position?   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | |  |  | AX | | BL | OF | |  |  | AH | AL | | mov al, 19h |  | 00h | 19h | 00h | 0 | | mov bl, 08h |  | 00h | 19h | 08h | 0 | | imul bl |  | **00h** | C8h | 08h | 1 | |  |  |  |  |  |  |   main ENDP  END main |

**Assembly Language – Integer Arithmetic (2)**

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| Group: | Student ID: | Name: |
| Student ID: | Name: |

7-2 Multiplication and Division Instructions

Objective: Understanding “DIV” instruction.

div， idiv

high/dx：余数， low/ax：结果

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| .code  main PROC  What are the register values at each position?   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | |  |  | AX | |  | | | | L1: |  | AH | AL | BL | | | | mov ax, 0775h |  | 07h | 75h | 00h | | | | mov bl, 10h |  | 07h | 75h | 10h | | | | div bl | ; al = Quotient | 05h | 77h | 10h | | | |  | ; ah = Remainder |  |  |  |  |  |     main ENDP  END main |

(2)

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| .code  main PROC  What are the register values at each position?   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | |  |  | AX | |  | | | | L1: |  | AH | AL | CL | | | | mov ax, 9000h |  | 90h | 00h | 00h | | | | mov cl, 10h |  | 90h | 00h | 10h | | | | div cl |  | 90h | 00h | 10h | | | |  |  | Why: al register 發生Overflow，因此程式執行到div cl指令即卡住結束，al和ah register保持原來的值 | | | | | |  |  |  |  |  |  |  |     main ENDP  END main |



