

EECE.3170: Microprocessor Systems Design I

Key Questions

Arithmetic instructions (Lectures 8 & 9)

QUESTIONS

1. Describe the x86 flags.
2. Describe the operation of the ADD, ADC, and INC instructions.
3. Describe the operation of the SUB, SBB, DEC, and NEG instructions.
4. Describe the operation of the MUL and IMUL operations.
5. Describe the operation of the DIV and IDIV operations.

EXAMPLES

1. Given the following initial state:

- AX = 0x1234
- BL = 0xAB
- Memory location SUM = 0x00CD

Show the results of each step of the following instruction sequence. Be sure to track the carry flag throughout the sequence:

```
ADD AX, [SUM]
ADC BL, 0x05
NEG BL
SUB AX, 0x12
INC WORD PTR [SUM]
```

2. Given $EAX = 00000005h$ and $EBX = 0000FF02h$, what are the results of the following instructions? Assume each instruction starts with the values shown above in EAX and EBX .

a. `MUL BL`

b. `MUL BH`

c. `IMUL BH`

d. `DIV BL`

e. `DIV BH`

f. `IDIV BH`