

# **EECE.3170: Microprocessor Systems Design I**

Summer 2016

## Lecture 7: Key Questions June 2, 2016

1. Describe the general structure and purpose of a subroutine.
2. Describe the basics of subroutines specific to the x86 instruction set.

3. Describe the operation of the CALL instruction.

4. Describe the operation of the RET instruction.

5. **Example:** Assuming  $AX = 2$  and  $BX = 4$ , show the results of the following sequence. Assume the addresses of the first three instructions are CS:0005, CS:0008, and CS:0009, respectively:

```
CALL SUM
RET                ; End main function
SUM PROC NEAR
    MOV DX, AX
    ADD DX, BX
    RET
SUM ENDP
```

6. Explain the different instructions used to save state on the stack.

7. Explain the different instructions used to restore state from the stack.

8. **Example:** Assuming the initial state below, what is the resulting stack state of each of the following sequences?

EAX: 12345678H  
EBX: 0000000AH  
ECX: FF0000FFH  
EDX: 00000000H  
ESI: 00000008H  
EDI: FFFF0000H  
EBP: 00000400H  
ESP: 00002000H  
DS: 2110H  
SS: 1000H

- a. PUSH BX  
PUSH AX

- b. PUSH EBX  
PUSH EAX

- c. PUSH A

9. Describe the issues involved in accessing data in assembly, including the two general factors the compiler must account for.

10. How does a program handle statically allocated data (data allocated at compile time)?

11. How does a program handle data that are dynamically allocated when a function is called?

12. Describe the structure of a typical x86 stack frame.