Review Questions

3.1) What general categories of functions are specified by computer instructions?

1. Processor-memory : Data may be transferred from processor to memory or from memory to processor
2. Processor-I/O : Data may be transferred to or from a peripheral device by transferring between the processor and an I/O module.
3. Data processing : The processor may perform some arithmetic or logic operation on data.
4. Control : An instruction may specify that the sequence of execution be altered. For example, the processor may fetch an an instruction from location 149, which specifies that the next instruction be from location 182, than PC fetch next instruction from location 182 rather than 150.

Problems

3.1)

1. IR read 3005 from memory.
2. load 3 from I/O device 5 to AC.
3. IR read 5940 from memory.
4. AC store 3+2 = 5 value.
5. IR read 7006 from memory.
6. AC store value(5) to I/O device 6.

3.3)

a. 24bits = 2^24 = 16MB
b. Discuss the impact on the system speed if the microprocessor bus has :
    a. Because of 16-bit local data bus, we should fetch 32-bit instruction twice.
    b. Because of 16-bit local data bus, we should fetch 32-bit instruction twice. And we can not access address once because we need at least 24-bit address bus width.
c. 24bit, 32bit

3.4)

a. 2^16
b. 2^16 because address bus has 16-bit width.

3.13)

a. 0.2ns * 1000 = 200ns, 200ns - 50ns = 150ns
b. 150ns + 20ns = 170ns
c. one wait state

3.14)

a. total 16 bus clock cycles, add wait state = 16 + 8 = 24 bus clock cycles, 50% increased
b. total 26 bus clock cycles, add wait state = 26 + 8 = 34 bus clock cycles, 30% increased

3.15)

a. 8MHz / 4 clock speed = 2MHz/s
b. add 1 clock cycle per memory access, 8MHz / 5 clock speed = 1.6MHz.