ICS Assignment 4

Name: _____ ID: _____

1. (D)The data in _____ is erased if the computer is powered down.

   (A) a tape drive (B) ROM (C) a CD-ROM (D) RAM

2. (C)A control unit with five wires can define up to _____ operations.

   (A) 10 (B) 5 (C) 32 (D) 16

3. (B)_____ is a stan-alone storage location that holds data temporarily.

   (A) A control unit (B) A register (C) An ALU (D) A tape drive

4. (A)The three steps in the running of a program on a computer are performed in the specific order _____.

   (A) fetch, decode and execute (B) execute, fetch and decode
   (C) decode, fetch and execute (D) decode, execute and fetch

5. (C)_____ can be programmed and erased using electronic impulses but can remain in a computer during erasure.

   (A) EPROM (B) ROM (C) EEPROM (D) PROM

6. A computer has 64 MB (megabytes) of memory. Each word is 4 bytes. How many bits are needed to address each single word in memory?
   Sol:
   We have $^{64\text{MB}}/_{(4\text{bytes per word})} = 16\text{Mega words} = 16 \times 2^{20} = 2^4 \times 2^{20} = 2^{24}$ words. Therefore, we need 24 bits to access memory words.

7. Compare and contrast the two methods for handling the addressing of I/O devices.
   Sol:
   Isolated I/O uses a set of instructions to access memory and another set of instructions to access I/O devices. Memory-mapped I/O uses the same set of instructions to access memory and I/O devices.

8. A computer uses memory-mapped I/O addressing. The address bus uses ten lines (10 bits). If memory is made up of 1000 words, how many four-register controllers can be accessed by the computer?
   Sol:
   The address bus uses 10 lines which means that it can address $2^{10} = 1024$ words. Since the memory is made of 1000 words and the system uses shared (memory-mapped I/O) addressing, $1024 - 1000 = 24$ words are available for I/O controllers. If each controller has 4 registers, then $^{24}/_4 = 6$ controllers can be accessed in this system.

9. An imaginary computer has 16 data registers (R0 to R15), 1024 words in memory, and 16 different instructions (add, subtract, and so on). What is the minimum size of an add instruction in bits if a typical instruction uses the following format: *add M R*2.
Sol:
We need 4 bits to determine the instruction ($2^4 = 16$). We need 4 bits to address a register ($2^4 = 16$). We need 10 bits to address a word in memory ($2^{10} = 1024$). The size of the instruction is therefore $(4 + 4 + 10)$ or 18 bits.

10. What is the minimum size of the control bus in the computer in problem 9?
Sol:
The control bus should handle all instructions. The minimum size of the control bus is therefore 4 bits ($\log_2 16$)

11. Describe parallel processing and its purpose.
Sol:
A single computer can have multiple control units, multiple ALU units and multiple memory units to perform several instructions in parallel. Parallel processing increases the throughput of the computer.