**Lab 2**

**Lab conditions:**

This lab exercise to be completed by the end of the class. No late submission will be accepted

Group discussion is encouraged, but each student has to make a single submission.

Submit Word document file on D2L

Make sure your following naming format as listed below:

Last name, First Name: Raj, Rylan Student ID: A01370947

**Questions:**

1. Research, discuss and explain the purpose of **seven** different personal computer (PC) hardware components. Create a table that briefly explains the purpose of each component.

|  |  |
| --- | --- |
| **Part** | **Purpose** |
| CPU | The CPU interprets, processes and executes instructions, most often from the hardware and software programs running on the device. The CPU performs arithmetic, logic, and other operations to transform data input into more usable information output. |
| Power Supply | Power supplies pull power from the wall outlet it’s connected to via cable and distributes it throughout the PC. Without the right amount power (Wattage) the PC won’t function correctly and there’s a chance it won’t even turn on. This is why it’s recommended to get a power supply above the necessary wattage of your computer. |
| Graphics Card | Responsible for calculating images in a computer which can then be displayed onto a monitor through the cards display port(s). |
| RAM | RAM (Random Access Memory) stores data of programs and applications which need to be accessed quickly by the CPU. |
| Storage | Storage is a mechanism that allows a computer to hold data either permanently or temporarily. Computers need to write information and read it from the storage system, so the speed of your storage determines how fast your computer can boot up, load, and access what you have saved. |
| Motherboard | The motherboard connects all your hardware to your processor, controls distributes from your power supply, and defines what specific hardware can be used cooperatively to run the system. For example, some motherboards support the use of multiple graphics cards and M.2 storages whilst others don’t. |
| Case | A case protects all of the expensive parts of the computer and sometimes may contain other internal components of it’s own like additional fans for cooling. |

1. **Desktop Computer DIY**. Suppose you decide to build a desktop computer and your budget is around $1000 (without software). Discuss and list all the parts and tools you have to purchase including price, speed/specification and a rationale why you selected this component. List the technical details and explain what your desktop computer is best suited for, such as listening to music, word processing, 3D design, software development or AI research.

|  |  |  |  |
| --- | --- | --- | --- |
| **Part/Perihperal List** | **Chosen Variation** | **Price** | **Why** |
| CPU | Ryzen 5 5600X | $219 |  |
| Power Supply | Thermal Take Toughpower GX2 600W | $84.99 |  |
| Graphics Card | XFX RX 580 8GB | $286.05 |  |
| RAM | Corsair Vengence 16GB DDR4 | $49.99 |  |
| Storage | Samsung 970 Evo 1TB | $69.98 |  |
| Motherboard | MSI B550 Gaming | $134.99 |  |
| Case | Deepcool CC560 | $59.99 |  |
| Keyboard | HP HyperX RGB | $29.99 |  |
| Mouse | Logitech G305 | $59.98 |  |

3. Download and run CPU-Z. Paste your screenshots (technical details) below.

4. **Challenge Question**

Consider the hypothetical machine:

Instruction Format: 16 bits (bits 0 to 3 for the opcode; 4 to 15 for the address).

Integer format: 2’s complement on 16 bits.

Partial list of opcodes:

0001 Load AC from memory

0010 Store AC to memory

0100 Add AC and R1, result will be in AC

0101 Add to AC from memory address

0111 Load register R1 from memory

0110 Load AC from I/O

1000 Store AC to I/O

1001 Move R1 to AC

Consider that the memory address 0x7A9 has the contents **16** in decimal represented in 2’s complement; memory address 0x7AA has contents **(-11)** in decimal represented in 2’s and the program starts at address 0xB2F. The address is word addressable (1 word = 16 bits).

Consider the following program:

Load R1 from memory address 7A9

Move R1 to AC

Load R1 from memory address 7AA

Add AC and R1

Store AC to address 7AB

1. Write out a sequence of bytes that represents this operation.

0001 = 1

0010 = 2

0011 = 3

0100 = 4

0101 = 5

0110 = 6

0111 = 7

1000 = 8

1001 = 9

1010 = 10

1011 = 11

1100 = 12

1101 = 13

1110 = 14

1111= 15

7A9 in binary = 0111 1010 1001

Opcode = 0111

Instruction: 0111 0111 1010 1001

Opcode = 1001

Instruction: 1001 0000 0000 0000 (No address)

7AA in binary: 0111 1010 1010

Opcode = 0111

Instruction: 0111 0111 1010 1010

Opcode = 0100

Instruction: 0100 0000 0000 0000 (No address)

Opcode = 0010

7AB in binary = 0111 1010 1011

Instruction: 0010 0111 1010 1011

Sequence of bytes that represent this operation: 0111 0111 1010 10011001 0000 0000 0000 0111 0111 1010 1010 0100 0000 0000 0000 0010 0111 1010 1011

1. What is the value (in base-2 and in base-10) stored at address 0x7AB after this operation?