**Computer Architecture**

**Homework 1 - Solutions**

Theme: Prerequisites

All questions carry equal weight. Show your work to receive credit.

1. What are the decimal and hexadecimal representations of the maximum and minimum numbers which can be represented by 16-bits in 2’s complement and unsigned representation?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Max, Dec | Max, Hex | Min, Dec | Min, Hex |
| 2's complement | 32767 | 7FFF | -32768 | 8000 |
| Unsigned | 65535 | FFFF | 0 | 0000 |

1. Convert the following numbers from the given base to the other three bases listed in the table (for octal conversion assume numbers are unsigned, otherwise assume they are signed 2’s complement):

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Decimal | **369** | -67 | -42 | -3129 |
| Binary | 0001 0111 0001 | **1011 1101** | 1101 0110 | 1111 0011 1100 0111 |
| Octal | 561 | 275 | **326** | 171707 |
| Hex | 171 | BD | **D6** | **F3C7** |

1. Give the BCD and ASCII representation of the number 36810 . Express your answer in hexadecimal.

**BCD: 030608 (unpacked) OR 368 (packed) ; ASCII: 333638**

1. In Fig 1.6 what do the words MAR, MBR, IBR stand for?

**MAR - Memory Address Register**

**MBR - Memory Buffer Register**

**IBR - Instruction Buffer Register**

1. What is a stored program computer? Explain Moore’s Law.

**A stored program computer is a computer that stores (and accesses) its instructions in memory. Moore’s Law is the prediction that the number of transistors that can be placed on a single chip will double every 1.5 years.**

1. Discuss the differences between an embedded computer system and a general-purpose computer.

**An embedded computer system is usually designed with a very specific application in mind and paired with special hardware. Examples of embedded computer systems included computerized gas pumps and computerized washing machines. A general purpose computer is designed to perform a variety of tasks suited to a variety of applications. The PC's we use daily are general purpose computers.**

1. What do you understand by Cloud computing?

**A model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources that can be rapidly provisioned and released with minimal management effort or service provider interaction.**

1. List and explain the main structural components of a computer and processor.

**There are four main structural components of a computer:**

1. **CPU - Controls the operation of the computer and performs its data processing functions**
2. **Main Memory - Stores data to be used by the computer**
3. **I/O - Transfers data between the computer and its external environment**
4. **System Bus - Provides communication between the different computer components**

**There are four main structural components of a CPU:**

1. **Control Unit - Controls the operations of the CPU and of the whole computer**
2. **Arithmetic and Logic Unit (ALU) - Performs the computer’s data processing functions.**
3. **Registers - Provide internal storage for the CPU**
4. **CPU Bus - Provides communication between the different CPU components**