Definitions and Concepts for AQA Computer Science GCSE

Topic 4: Computer systems

Hardware: The physical components of a computer system that can be seen and touched.

Software: The program code that is executed by the hardware. It is a set of instructions that controls the operations of the hardware.

NOT Gate: A logic gate that inverts the input; if the input is true, the output is false, and vice versa.

AND Gate: A logic gate that outputs true only if all its inputs are true.

OR Gate: A logic gate that outputs true if at least one of its inputs is true.

XOR Gate: A logic gate that outputs true if exactly one of its inputs is true, but false otherwise.

Truth Table: A table showing all possible input combinations for a logic gate or circuit and the corresponding output.

Logic Circuit Diagram: A visual representation using standard symbols for logic gates and their connections to show how a circuit performs a logical function.

Boolean Expression: An algebraic expression that represents the logic of a circuit or condition using Boolean operators (AND, OR, NOT, XOR).

System Software: Software that manages and controls the computer hardware and acts as a platform to run application software.

Application Software: Software that performs specific tasks for the end-user (e.g., word processors or web browsers).

Operating System (OS): System software that manages the computer's hardware and software resources, including processor(s), memory, input/output (I/O) devices, applications, and security.

Utility Programs: System software designed to help maintain, enhance, and troubleshoot a computer system (e.g., disk defragmenter, antivirus).

Low-level Language: A programming language that is closer to machine code and the hardware's instruction set (e.g., machine code, assembly language).

High-level Language: A programming language that is closer to human language, designed for ease of use, readability, and portability across different computer architectures.

Machine Code: The lowest-level programming language, specific to a processor, consisting of binary instructions that a computer's CPU can directly execute.

Assembly Language: A low-level programming language that uses mnemonics to represent machine code instructions, which often have a 1:1 correspondence with machine code.

Translator: A program that converts source code written in one programming language into another language (often converting programs written in high-level languages into machine code so that they can be executed by a computer's hardware).

Interpreter: A type of program translator that executes source code line by line, without first compiling the entire program into machine code.

Compiler: A type of program translator that translates the entire source code of a program into machine code (an executable file) before the program is run.

Assembler: A type of program translator that translates assembly language code into machine code.

Main Memory: Any form of memory that is directly accessible by the CPU, excluding cache and registers.

Central Processing Unit (CPU): The electronic circuitry within a computer that carries out the instructions of a computer program.

Von Neumann architecture: A model for CPU design where both instructions and data are stored in the same memory and accessed via a single bus.

Arithmetic Logic Unit: A component within the CPU responsible for performing arithmetic operations (addition, subtraction, etc.) and logical operations (AND, OR, NOT).

Control Unit: A component within the CPU that manages and coordinates the other components of the computer, fetching and decoding instructions.

Clock: A component within the CPU that generates a regular sequence of electrical pulses (clock cycles) to synchronize the operations of the CPU.

Register: A small, very fast storage location within the CPU that holds data temporarily during processing.

Bus: A collection of wires or electrical pathways through which data and signals are transmitted between different components within a computer system.

Clock Speed: The rate at which a CPU executes instructions, measured in Hertz (Hz), which affects CPU performance.

Number of Processor Cores: The number of independent processing units within a single CPU, allowing for parallel execution of tasks and affecting performance.

Cache Size: The amount of fast, temporary memory (cache) available to the CPU, which stores frequently accessed data for quicker retrieval and affects performance.

Fetch-Execute Cycle: The fundamental process by which the CPU continually retrieves instructions stored in main memory and executes them.

- **Fetch:** The next instruction is fetched from memory to the CPU
- **Decode:** The CPU interprets the fetched instruction to determine what operation needs to be performed.
- **Execute:** The CPU performs the operation specified by the instruction, which may involve reading/writing to main memory.

RAM (Random Access Memory): Volatile main memory that can be read from and written to, used for temporary storage of data and programs currently in use by the CPU.

ROM (Read-Only Memory): Non-volatile memory that can only be read from, typically storing essential startup instructions that do not change.

Volatile: A type of memory whose contents are lost when the computer loses power.

Cache: A small, high-speed memory area used to store frequently accessed data and instructions, providing faster access than main memory.

Secondary Storage: Non-volatile storage mechanisms that are not directly accessible by the CPU, used for long-term storage of data (e.g., hard drives, SSDs).

Solid State Storage (SSD): A type of secondary storage that uses electrical circuits (flash memory, specifically NAND gates) to persistently store data, with no moving parts.

Optical Storage: A type of secondary storage that uses lasers to read and write data on a rotating disc (e.g., CDs, DVDs, Blu-ray discs).

Magnetic Storage: A type of secondary storage that uses magnetic patterns to store data on a rapidly rotating disk (e.g., Hard Disk Drives - HDDs).

Cloud Storage: The practice of storing digital data on remote servers accessible over a network (typically the internet), rather than directly on the user's device.

Embedded System: A computer system with a simple, dedicated function within a larger mechanical or electronic system (e.g., in a washing machine or car).