Definitions and Concepts for OCR Computer Science A-level

Component 1.1: The Characteristics of Contemporary Processors, Input, Output and Storage Devices

---

1.1.1 Structure and Function of the Processor

Accumulator (ACC): A special register to temporarily store the results of operations performed by the ALU.

Address Bus: Carries the memory location address of the register the data is being carried to or from.

Arithmetic and Logic Unit (ALU): A part of the CPU that performs arithmetic calculations and logical operations on data for the computer programs.

Buses: A physical set of parallel wires connecting and carrying groups of bits between several components of a computer.

Cache: A small and fast but expensive memory in the CPU used to store instructions and data that are accessed regularly.

Clock Speed: The frequency at which the internal clock generates signals switching between 0 and 1. It controls how often instructions are executed and data is fetched.

Contemporary Processor Architecture: A modern computer architecture combining elements of both Von Neumann and Harvard architectures.

Control Bus: A bi-directional bus carrying control signals from the CU to synchronise access and use of data.

Control Unit: A part of the CPU that controls and manages the execution of instructions. It sends control signals to coordinate execution and controls Fetch-Decode-Execute cycles and buses.

Current Instruction Register (CIR): A special register that stores the current instruction being executed and decoded. The instructions are divided into operand and opcode.

Data Bus: A bi-directional bus for carrying data and instructions between the processor and memory.

This work by PMT Education is licensed under CC BY-NC-ND 4.0

Fetch-Decode-Execute Cycles: The process of fetching from memory (supplying the address and retrieving the instruction from memory), decoding (interpreting the instruction and then reading and retrieving the the required data from their addresses) and executing the instruction (CPU carries out the required actions).

Harvard Architecture: A computer architecture that stores data and instructions in separate memories to allow the next instruction to be read while data is currently being read or written.

Memory Address Register (MAR): A special register that stores the memory address of the next instruction to load or data to use.

Memory Data Register (MDR): A special register that temporarily stores data to be read from or written to the computer's memory.

Number of Cores: A core is a processing unit that handles instructions with its own fetch-execute-decode cycles. Multi-core processors have multiple cores that can run simultaneously.

Pipelining: The simultaneous decoding of several instructions by decoding the next instruction and fetching the one after while the current one is being decoded.

Program Counter (PC): A special purpose register that stores the address of the next instruction to execute.

Registers: Special memory cells that can be accessed quickly. They temporarily store data and control information.

Von Neumann Architecture: A computer architecture where a single control unit manages program control via a linear sequence of fetch-execute-decode cycles.

1.1.2 Types of Processor

Complex Instruction Set Computer (CISC): A more complicated and expensive processor design that can execute a series of tasks in a single complex instruction built into the hardware. The variety of instructions means less RAM is used, but pipelining is not possible.

Graphic Processing Unit (GPU): A specialised processing unit with a huge number of small cores that allow efficient parallel computation for tasks such as computer graphics, machine learning, data mining etc.

Multicore Systems: Several CPU cores are incorporated into a single processor chip to help distribute workload.

Parallel Processing System: Splitting a job into several subtasks which are simultaneously carried out by each core in the system.

Reduced Instruction Set Computer (RISC): A simpler processor design that can only

CC BY NC ND

execute a single simple instruction each clock cycle. This uses more RAM but allows pipelining.

1.1.3 Input, Output and Storage

Flash Storage: A solid state technology that stores data on a collection of memory chips. No moving parts as data is accessed by software.

Input Devices: Peripheral devices that allow the user communicate and to pass readable data into a computer, decode it and send it to the CPU.

Magnetic Storage: Relies on the polarisation of magnetic particles to store bits on a magnetic material which is typically moved mechanically. A high capacity and low cost means of storage.

Optical Storage: Data is stored in the reflectivity (pits and lands) of a surface, and is read and written to by a laser.

Output Devices: Peripheral devices that take convert signals from a computer into a human-readable form.

Random Access Memory (RAM): Memory used to store programs and data in use by the computer. Quick access times by all data is lost when the computer is turned off (volatile memory).

Read-Only Memory (ROM): Memory used to store information that is permanently required to boot up and run the computer. Cannot be written to and is non-volatile.

Storage Device: Any medium on which data can be stored even when powered off.

Virtual Storage: Using the hard disk as though it were an extension of memory to free up more RAM for current programs.

CC BY NC ND