# 1.1 SYSTEMS ARCHITECTURE

KEY CONCEPTS

➢ Computer systems take data (input), process it and then output it.
➢ **Embedded systems** are computers built in to other devices like washing machines. They are dedicated to a single task so they are efficient.
➢ **Clock speed:** the number of instructions a processor can carry out per/second. Higher clock speed = faster CPU.
➢ Number of **Cores:** The more cores a CPU has the more instructions it can carry out at once (multitasking). More cores = faster processing.
➢ **Cache size:** A larger cache gives the CPU faster access to more data
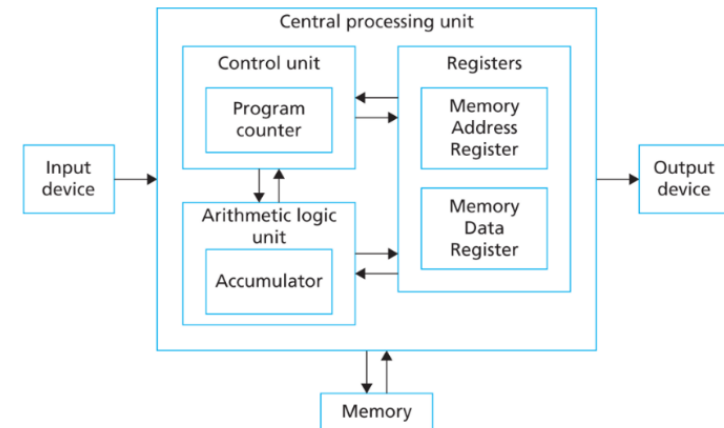
FETCH – DECODE – EXECUTE CYCLE

CPU **fetches** instruction from the RAM
(Copies memory address to MAR, copies
Instruction to MDR & adds 1 to PC.
CU **decodes** the instruction from the MDR
Instruction is **executed** by the CU
The next instructions is fetched and
The cycle repeats.

Fetch

Execute ← Decode
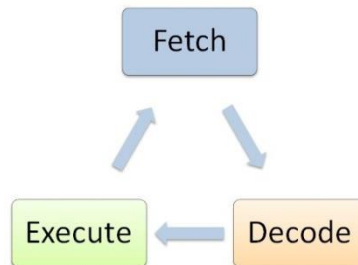
EXAM QUESTIONS

1. Explain how cache size, cores and clock speed affect the performance of the CPU.
2. Define what is meant by an embedded system
3. What is the purpose of the ALU?
4. Explain the role of the CPU registers (MAR and MDR)
5. Explain how the fetch decode execute cycle works

THE CENTRAL PROCESSING UNIT (CPU)

Central processing unit
Control unit
Program counter
Registers
Memory Address Register
Input device
Arithmetic logic unit
Accumulator
Memory Data Register
Output device
Memory

Control Unit (CU): executes instructions and controls the flow of data in the CPU.

Program counter: holds the memory address for the instruction of each cycle.

Arithmetic Logic Unit (ALU): does all of the calculations and logic operations.

Accumulator: holds the result of any calculations in the ALU.

Cache: very fast memory that stores regularly used data so that the CPU can access it quickly.

MAR (Memory Address Register): holds the address about to be used by the CPU.

MDR (Memory Data Register): holds the actual data or instruction being processed by the CPU.