

1.1 Systems architecture – Past Exam Questions

1.1 – Systems architecture	
Sub topic	Guidance
1.1.1 Architecture of the CPU	
<input type="checkbox"/> The purpose of the CPU: <ul style="list-style-type: none"> ○ The fetch-execute cycle <input type="checkbox"/> Common CPU components and their function: <ul style="list-style-type: none"> ○ ALU (Arithmetic Logic Unit) ○ CU (Control Unit) ○ Cache ○ Registers <input type="checkbox"/> Von Neumann architecture: <ul style="list-style-type: none"> ○ MAR (Memory Address Register) ○ MDR (Memory Data Register) ○ Program Counter ○ Accumulator 	<p>Required</p> <ul style="list-style-type: none"> ✓ What actions occur at each stage of the fetch-execute cycle ✓ The role/purpose of each component and what it manages, stores, or controls during the fetch-execute cycle ✓ The purpose of each register, what it stores (data or address) ✓ The difference between storing data and an address <p>Not required</p> <ul style="list-style-type: none"> ✗ Knowledge of passing of data between registers in each stage
1.1.2 CPU performance	
<input type="checkbox"/> How common characteristics of CPUs affect their performance: <ul style="list-style-type: none"> ○ Clock speed ○ Cache size ○ Number of cores 	<p>Required</p> <ul style="list-style-type: none"> ✓ Understanding of each characteristic as listed ✓ The effects of changing any of the common characteristics on system performance, either individually or in combination
1.1.3 Embedded systems	
<input type="checkbox"/> The purpose and characteristics of embedded systems <input type="checkbox"/> Examples of embedded systems	<p>Required</p> <ul style="list-style-type: none"> ✓ What embedded systems are ✓ Typical characteristics of embedded systems ✓ Familiarity with a range of different embedded systems

2022

Complete the table by writing the missing definition or name of each of the common CPU components and registers.

CPU component or register	Definition
	Stores the address of the next instruction to be fetched from memory. Increments during each fetch-execute cycle.
CU (Control Unit)	
	Stores the address of the data to be fetched from or the address where the data is to be stored.
	Performs mathematical calculations and logical operations.

[4]

2021

(b) (i) State the purpose of a CPU.

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 [1]

(ii) State what is meant by a single core 2.5 GHz processor.

.....

 [2]

(c) Von Neumann architecture includes registers.

Identify **two** registers used in Von Neumann architecture.

1
 2 [2]

2020

3 Draw **one** line from each part of the processor to its correct definition.

Part of the processor	Definition
Control Unit (CU)	Performs mathematical operations
Cache	Sends signals to direct the operations
Arithmetic Logic Unit (ALU)	Keeps the clock in sync
Register	A small piece of memory inside the processor that can hold one instruction or address
	High speed memory inside the processor that stores recently used instructions

[4]

2019

- 1 Kerry wants to buy a new computer, but she does not understand what the different parts of a computer do.

(a) Kerry has heard of a CPU but does not know what it is.

(i) The following sentences describe the purpose of a CPU.

Complete the sentences by filling in the missing words.

CPU stands for

It is the part of the computer that fetches and executes the

that are stored in

The CPU contains the Arithmetic Unit (ALU) and
the Unit (CU).

[5]

(ii) Kerry is looking at two computers; one has a single core processor and the other has a dual core processor.

Explain why having a dual core processor might improve the performance of the computer.

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..... [2]

(iii) One computer has 64 kilobytes of cache and the other has 512 kilobytes of cache.

Explain how the cache size can affect the performance of the CPU.

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.....
..... [2]

- (i) Tick (✓) **one** box to show whether the smart watch or the laptop is an example of an embedded system.

	Is an example of an embedded system
Smart watch	
Laptop	

[1]

- (ii) Justify your choice to **part (i)**.

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..... [2]

2018

- 4 Alicia has designed a computer using Von Neumann architecture.

- (a) Describe the purpose of **two** registers that are used by Von Neumann architecture.

1

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2

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..... [4]

- (b) The CPU has a clock speed of 3.8 GHz.

Describe what is meant by a clock speed of 3.8 GHz.

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..... [2]

(c) Alicia says:

"My computer has a quad-core processor, so it will run twice as fast as a computer with a dual-core processor."

Explain why this statement is not always true.

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..... [3]

2016 – Legacy Papers (Old spec, but is still relevant)

6 Quinn's current computer specification is shown in Fig. 4.

1.5 GHz Dual Core Processor
1GB RAM
100GB Hard Drive
64KB Cache
Touchscreen
Integrated camera and speakers
2 × USB 3.0 ports
2 × USB 2.0 ports
Blu-ray drive
2GB Graphics Card

Fig. 4

(a) Describe the benefits of a dual core processor over a single core processor.

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..... [2]

2015

- (b) The tablet computer also uses cache memory.

Describe the purpose of cache memory.

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..... [2]

Some more questions that may be relevant

2. A processor contains a number of special registers.

Explain the need for the following registers.

- (i) Program Counter (PC)

----- [2]

- (ii) Memory Address Register (MAR)

----- [2]

- (iii) Memory Data Register (MDR)

----- [2]

3. Computer architectures use registers including the accumulator.

Describe **two** ways in which the accumulator is used.

1

2

[4]

- 5(a). A company is designing a new low-power processor to be used in a smartwatch.

The processor contains a control unit.

Describe the role of the control unit in the processor.

[2]

6. Describe how each of these improves a processor's performance:

(i) fast clock speed

[2]

(ii) large cache memory

[2]

Bonus Question (just to get exam definitions, you wouldn't be asked this in the GCSE)

8.



A student, Dan, on a limited budget finds his computer is running slowly. He uses his computer for university work and internet browsing.

Discuss what measures can be taken to improve Dan's computer's performance. You should explain what these measures are, why they improve the performance and justify whether you would recommend them.
