Zig Zag Education

Computer Science GCSE (9–1) | OCR | J277

Topic Tests

for OCR GCSE Computer Science (J277)

Component 1: Computer Systems

Update v1.1, 10 May 2022

zigzageducation.co.uk POD 11238

Contents

Teacher's Introduction

Welcome to the OCR GCSE Computer Science Topic Tests, which have been written specifically for J277 specification, for first teaching September 2020 (assessment from 2022 onwards). This particular set of 16 tests covers the prescribed learning content for ***Component 1: Computer Systems***.

These topic tests have been written with all new content for the J277 specification. These questions are designed to be used as end of unit tests, as unlike actual exam questions, they are designed to ask around the topic, supporting the knowledge required by the specification as opposed to sticking strictly to it. However, I took the decision to still write the questions in the style of real exam questions, which means they will better prepare students for the style of answers required. I also wrote the mark scheme to be like an exam mark scheme to help you as a teacher to understand where credit should and should not be awarded.

As such the following guidance should be followed when marking:

- Each bullet point is a single mark. You should not award 2 marks for points in one bullet point
- A "//" denotes an alternate answer for the same mark (not an extra mark) and a "/" an alternate phrasing
- Bold means this point must be made, e.g., for describing multiple cores **simultaneous** would be in bold as the student must describe this concept to get the mark
- Underline means the exact word must be in the answer (this is very rare)
- "…" at the end of a bullet point means this point must be made before the following points beginning with a "…" can be awarded. For example, when describing the best secondary storage to use in a camera and why, you would need to state a memory card before you can get awarded points for saying it is portable and can be moved from device to device.
- "…" at the beginning of a point without a preceding point with "…" at the end just means this point follows on logically. It can be awarded on its own, but it likely to come after the preceding point.
- Mark schemes that begin with "E.g." means that this question is very open and a mark scheme cannot cover every possible response and the given bullet points should be taken as indicative, awarding marks for any similar sensible response. For non- "E.g." questions, you should try to stick to the mark scheme.

I have also specified which Assessment Objective(s) (AOs) each question relates to, as this gives students a chance to understand what the AO's mean and recognise when they must apply their answers.

Each section has two question papers (*Set A* and *Set B*), which gives you options for showing progress, or using one when you teach and one when you do revision. Whilst the marks available for each sections varies – as some require more work – I have tried to keep the marks similar for the A and B tests and ensured that key concepts are covered by both.

Remember!
Always check the exam board website for new information, including changes to the specification and sample assessment material.

Update v1.1, 10 May 2022

- Corrected mark scheme from 'multiplied' to 'divided' for question 3, Test 1.2.3–5 (Set B) on page 75.

1.1 – Systems Architectu

Test A (32 Marks)

QUESTION 1 – AO1

A CPU is made up of many components. In the following table, match the descrip
Add **one** tick per row.

	Contr unit	Arithmetic logic unit
Small memory locations that hold a sing o data and have the fastest read/ s .		
Part of the CPU tha es all the calculations and comp for the execute phase of the fetch–deco ecute cycle.		
Memory with a faster read/write speed than RAM that holds frequently and recently used data and instructions.		
Part of the CPU that coordinates the running of the fetch–decode–execute cycle.		

QUESTION 2 – AO1

Which of the following is an embedded system?

Tablet	
Payment card reader	

QUESTION 3 – AO1

Explain the difference between improving the performance of a CPU by increasin
increasing the number of cores.

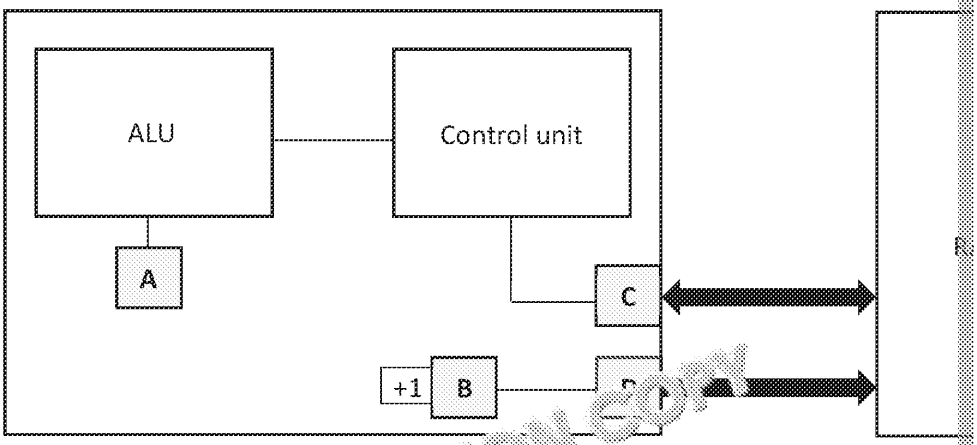
.....

.....

.....

.....

Question 4 – AO1



In the above diagram of a CPU, the four special-purpose registers used in the fet
labelled A–D. Identify the name of each of the four registers.

A	
B	
C	
D	

Question 5 – AO1

Name and describe the purpose of **two** registers used in the CPU during the fetc

1. .....

.....

2. .....

.....

Question 6 – AO2

The table below shows two computer systems.

Computer A	Computer B
Clock speed: 2 GHz	Clock speed: 4 GHz
Core: Quad core	Core: Dual core
Cache: 4 MB	Cache: 8 MB

Which of the two systems would have a better performance, and why?

.....

.....

.....

.....

QUESTION 7 – AO1/AO2

In Question 6 you justified which computer system has the better performance. S
to improve the performance of the slower system and how it would improve its

QUESTION 8 – AO2

Describe why CPU A, which has a single-core 3.5 GHz processor, may have better
CPU B, which has a dual-core 2 GHz processor.

QUESTION 9 – AO2

Charlie received a new smartphone for her birthday. Her friend Brittany told her
device. Explain why Brittany is not correct with her claim.

QUESTION 10 – AO1/AO2

Von Neumann architecture and the stored program concept are key concepts in

Describe the advantages these give to the first programmable computers over o
computing devices.

Preview of Questions Ends Here

1.2.1–1.2.2 – Primary and Secondary Storage – Test A

Answer

1

	Primary storage	Secondary storage	Volatile	Non-volatile	Magnetic	Optical	Solid state
RAM	✓		✓				✓
ROM	✓	✓	✓				✓
Cache	✓		✓				✓
Hard drive				✓	✓		
DVD-R		✓		✓		✓	
USB memory stick		✓		✓			✓

2

- RAM is volatile; ROM is non-volatile
- RAM is primary storage; ROM can be secondary storage
- RAM is expandable; ROM (tends to be) fixed size
- RAM changes its contents; ROM does not (usually) change its contents

3

Fastest	Cache
⇧	RAM
	SSD
	USB memory stick
	HDD
Slowest	Magnetic tape

1 mark per correctly placed result

4

- Stores the currently running program/instructions
- Stores the data currently being worked on
- Stores the operating system

	Answer
5	• Virtual memory is a section of secondary storage • Primary storage is filled up • As new programs are opened (after primary storage is filled)… • … least-used programs are copied into virtual memory • When programs in virtual memory are activated, they are swapped with an inactive program in primary storage
6	• No moving parts… • … making the device durable / it can be used while moving it around / being portable • … allowing lower power consumption • Small form factor • … which can fit into smaller devices • Low power consumption… • … allowing devices to run for longer
7	There are three different types of technology used in secondary storage. The technology with the fastest read/write speed is **solid state**, which started out as flash memory which you would find in USB memory sticks or **SD** cards. It contains no moving parts so is exceptionally **durable**, and it can have a small form factor and low power requirements, which make it ideal for use in tablets, phones and ultra-light laptops. The most common technology used in desktop PCs is **magnetic**, whereby HDDs use spinning platters to store data. They can have high **capacities** at a cheaper price per GB than solid state. The final technology is **optical**, which uses lasers bounced off a reflective disc to store data. Initially, they were CDs, primarily used to store music, but advances in engineering led to **DVDs**, which stored films, and **Blu-rays**, which stored films in 4K resolution.
8	• More RAM would mean the system is less likely to require virtual memory • Virtual memory involves using secondary storage • RAM has a faster read/write speed than secondary storage
9	• SSDs… • … high read/write speed allows fast capture of data from multiple sources • … high read/write speed allows for movement of data when processing data • … can have very large capacity

	Answer
10	**Mark band 3 – high level (6–8 marks)** The candidate demonstrates a thorough knowledge and understanding of a wide range of considerations in relation to the question; the material is generally accurate and detailed. The candidate is able to apply their knowledge and understanding directly and consistently to the context provided. Evidence/examples will be explicitly relevant to the explanation. The candidate is able to weigh up both sides of the discussion and in detail with reference to the impact on all areas, showing thorough recognition of influencing factors. *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.* **Mark band 2 – mid level (3–5 marks)** The candidate demonstrates reasonable knowledge and understanding of a range of considerations in relation to the question; the material is generally accurate but at times is underdeveloped. The candidate is able to apply their knowledge and understanding directly to the context provided, although one or two opportunities are missed. Evidence is / examples are, for the most part, implicitly relevant to the explanation. The candidate makes a reasonable attempt to discuss the impact on most areas, showing reasonable recognition of influencing factors. *There is a line of reasoning presented with some structure. The information presented is, for the most part, relevant and supported by some evidence.* **Mark band 1 – low level (1–2 marks)** The candidate demonstrates a basic knowledge of considerations, with limited understanding shown; the material is basic and contains some inaccuracies. The candidate makes a limited attempt to apply acquired knowledge and understanding to the context provided. The candidate provides nothing more than an unsupported assertion. *The information is basic and is communicated in an unstructured way. The information is supported by limited evidence, and the relationship to the evidence may not be clear.* **0 marks** No attempt to answer the question, or response is not worthy of credit. **Indicative content:** ***HDD*** Benefit • Cheaper cost per GB • Can have high storage capacity (cheaper) Drawback • Slower read/write speed • Higher energy usage ***SDD*** Benefit • Faster read/write speed • Lower power consumption • Higher capacity (but at a price) Drawback • More expensive per GB

Preview of Answers Ends Here