



REAL WORLD CHALLENGE

The Mystery of the Faulty Exam Computer

Tomorrow morning, Year 11 students are due to sit their GCSE Computer Science mock examination. During the final system checks, one computer powers on successfully and displays the operating system. Files stored on the SSD can still be opened, but applications freeze before completing any task. Diagnostic tests show that instructions are fetched from memory successfully but are not decoded before execution. Registers continue to store temporary values and cache memory is operating normally. The school can replace only one CPU component before the examination begins.

Component or Stage	Observed Behaviour	Evidence
Control Unit	Suspected fault	Control signals are not generated
ALU	Idle	No decoded instructions received
Registers	Operational	Temporary values stored correctly
Cache Memory	Operational	Temporary values stored correctly
Fetch Stage	Successful	Instructions retrieved from memory
Decode Stage	Failed	Instructions cannot be interpreted

A

MAIN QUESTION

Which CPU component should the technician replace? Produce a justified recommendation using the evidence.

B

CHALLENGE QUESTIONS

- Identify the strongest piece of evidence supporting your recommendation.

- Assess whether replacing the cache memory would resolve the fault.

- Predict the outcome if the technician replaced the ALU instead.

C

EXAM QUESTIONS

1. State two responsibilities of the Control Unit.

2 MARKS

2. Distinguish between the purpose of registers and cache memory.

2 MARKS

D

EXTENSION CHALLENGE *(Complete this task on a separate sheet of paper)*

Recommend one improvement that would help technicians diagnose similar CPU faults more quickly.