MODULE A SYSTEMS ARCHITECTURE · A5

CPU performance

Original practice questions · ~25 minutes · 20 marks · 0478 syllabus 3.1.3

Name _____ Date _____

Instructions. Answer all questions in the spaces provided. The marks for each part are shown in brackets [ ]. The total for this worksheet is **20 marks**.

1

Total: 4 marks

A weather service uses a computer to process readings from its weather stations. The computer's CPU has a clock speed of 2.5 GHz.

(a) Tick (✓) one box to show what the clock speed of a CPU measures. **[1]**

Description	Tick (✓)
The number of instructions stored in cache	
The number of fetch-decode-execute cycles carried out per second	
The number of cores that can work at the same time	
The amount of data that can be stored in RAM	

(b) State how many fetch-decode-execute cycles per second a clock speed of 2.5 GHz represents. **[1]**

(c) Explain how increasing the clock speed could improve the performance of the CPU. **[2]**

2 **Total: 5 marks**

The CPU has 4 MiB of cache. The weather service is thinking about a CPU with 8 MiB of cache instead.

(a) Describe what is meant by cache. **[2]**

(b) Explain why increasing the size of the cache from 4 MiB to 8 MiB could improve the performance of the CPU. **[3]**

3 **Total: 4 marks**

The weather service replaces its dual-core CPU with a quad-core CPU. The clock speed and cache size stay the same.

(a) Explain how having more cores could improve the performance of the CPU. **[2]**

(b) One program the weather service uses is no faster on the quad-core CPU. Explain why. **[2]**

4 **Total: 4 marks**

(a) Tick (✓) one box in each row to show whether each statement is true or false. **[4]**

Statement	True (✓)	False (✓)
Each core in a CPU can fetch, decode and execute its own instructions.		
Cache is slower to access than RAM.		
A clock speed of 3 GHz means 3 million cycles per second.		
A larger cache means the CPU needs to fetch from RAM less often.		

5 **Total: 3 marks**

A video editing company finds that its computer's CPU often has to wait for data and instructions to arrive from RAM.

(a) Identify the CPU characteristic the company should change to reduce this waiting. Explain how the change would help. **[3]**

Total for this worksheet: 20 marks