

THEME A: CONCEPTS · A1.1

Computer hardware and operation

Original practice questions · 35 marks · about 50 minutes · covers A1.1.1–A1.1.9

Instructions. Answer all questions. The maximum mark for this paper is [35 marks]. The marks available are shown in brackets. Parts badged **HL** assess higher level only content; standard level students may leave these out.

1 Total: 6 marks

A weather station uses a single-board computer to record temperature readings and store them in a file.

(a) Identify the CPU register that holds the address of the next instruction to be fetched. [1]

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(b) Outline the function of the memory address register (MAR). [2]

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(c) The instruction has been copied into the instruction register. Describe how the control unit then decodes it. [3]

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2 Total: 4 marks

The processor in the weather station fetches a single instruction from primary memory.

Explain the roles of the address bus, the data bus and the control bus during this fetch. [4]

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A laptop stores its start-up firmware in ROM, runs open programs in RAM, and keeps the user's documents on an internal solid state drive (SSD).

- (a) Distinguish between RAM and ROM. [2]

- (b) Explain how cache memory improves the performance of the CPU. [3]

- (c) State **one** advantage of an SSD compared with a hard disk drive (HDD). [1]

A streaming company stores two kinds of file on its servers: high-resolution film files, and separate subtitle files that contain only text.

- (a) Distinguish between lossy compression and lossless compression. [2]

- (b) Explain why lossless compression must be used for the subtitle files. [2]

- (c) Outline how run-length encoding reduces the size of a file. [2]

A start-up company is building a booking application. It must choose between using platform as a service (PaaS) and buying and maintaining its own servers.

- (a) Identify the cloud service model in which the customer manages the operating system and the applications, but not the physical hardware. [1]

- (b) **Discuss** the use of platform as a service (PaaS) by this company, rather than buying and maintaining its own servers. [5]

A research team trains a machine learning model that processes very large numbers of images. The team upgrades its workstation with a graphics processing unit (GPU).

- (a) Describe the role of a GPU. [2]

- (b) **HL** Explain **two** differences between a CPU and a GPU that make the GPU better suited to training this model. [3]

- (c) **HL** Outline why a pipelined processor completes more instructions per second than a non-pipelined processor running at the same clock speed. [2]

END OF QUESTIONS