

THEME A: CONCEPTS · A1.3

Operating systems and control systems

Original practice questions · 34 marks · about 50 minutes · covers A1.3.1–A1.3.7

Instructions. Answer all questions. The maximum mark for this paper is [34 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: 5 marks**

A student installs a photo-editing application on a laptop and runs it at the same time as a web browser.

- (a) Outline how an operating system hides the complexity of the hardware from the user of this application. **[2]**

- (b) Describe how the memory management function of the operating system allows the photo editor and the browser to run at the same time. **[3]**

2**Total: 5 marks**

A university runs a single shared server that many students log in to at the same time.

- (a) The university wants to find out which students are using the most processor time. Outline how the accounting function of the operating system makes this possible. **[2]**

- (b) Outline **one** reason why the university would use virtualization on this server. **[2]**

- (c) State **one** security function performed by an operating system. **[1]**

Four processes are waiting for the CPU on a computer. All four arrive at the same time and their CPU requirements are shown in Table 1.

Table 1: Processes waiting for the CPU

Process	CPU time required (ms)
P1	6
P2	2
P3	8
P4	4

- (a) Explain why process P2 is held up when these processes are scheduled using first-come first-served in the order P1, P2, P3, P4. [3]

- (b) Describe how round robin scheduling would treat these same four processes differently. [2]

- (c) Identify the scheduling approach that places processes into separate queues according to their type or priority. [1]

- (d) State **one** disadvantage of priority scheduling. [1]

A battery-powered fitness tracker must react when the user presses its single button. The same processor also reads a heart-rate sensor at regular intervals.

- (a) Describe how the tracker's processor would detect the button press if polling were used instead of an interrupt. [2]

- (b) **Evaluate** the use of interrupt handling rather than polling for detecting the button press on this device. [4]

An operating system runs many processes at the same time. Several of them need to use the same printer and the same disk.

- (a) **HL** Explain what is meant by resource contention. [2]

- (b) **HL** Explain how deadlock can occur between two of these processes. [3]

A greenhouse uses an automatic control system to keep the air temperature at a value set by the gardener. When the temperature rises above that value, a motor opens a roof vent.

- (a) **HL** Identify the sensor and the actuator in this control system. [2]

- (b) **HL** Describe how feedback allows this system to hold the air temperature at the value set by the gardener. [3]

- (c) **HL** State **one** other everyday device that is controlled in this way. [1]

END OF QUESTIONS