1. Application software is run on thin client computers. A thin client computer is a very low-powered computer connected to a powerful central server. The operating system and all the applications run within a virtual machine on the server. The thin client computer will only display the output of the virtual machine and capture and send input to the virtual machine.

State **one** advantage of running the application software within the virtual machine.

_____

_____ **[1]**

2(a). Two roles of an operating system are to handle interrupts and manage scheduling.

i. Describe **two** other roles of an operating system.

1 _____

_____

_____

_____

2 _____

_____

_____

_____ **[4]**

ii. Draw a line to match each scheduling algorithm to the correct description.

Scheduling Algorithm	Description
Round Robin	Splits processes into different priority queues based on the amount of processor time they need. It allows them to move between the queues as their characteristics change
First come first served	Selects the process that takes the shortest amount of time to complete. The processes are run until they are fully complete
Multi-level feedback queues	Each process is allocated a fixed amount of CPU time. If the process is not complete it will be suspended and the next process will start
Shortest job first	Each process is given equal priority and they are processed in the order they arrive
Shortest remaining time	Selects the process that takes the shortest amount of time. The process can be suspended if another shorter process is added

[5]

(b). One use of ROM is to store the Basic Input Output System (BIOS). The BIOS is used when the computer is first turned on.

i. Describe what the BIOS will do to start up the computer.

[3]

ii. Apart from storing the BIOS, ROM can also be used in other ways.

Describe how an embedded system can make a different use of ROM and why it is an advantage.

[2]

3(a). A secondary school is upgrading their computers. They decide to install "thin client" computers. A thin client computer is when users access their computer in the usual way with a keyboard, mouse and monitor. However, all processing takes place on the virtual machine on a server rather than the computer at their desk.

i. Describe **one** advantage of using virtual machines in this way.

[2]

ii. Describe **one** disadvantage of using virtual machines in this way.

[2]

(b). Each virtual machine will run an operating system. One type of operating system is multi-user.

Describe **two** other types of operating system and give an example of where each may be used.

TYPE 1

Description

Example

TYPE 2

Description _____

_____

_____

_____

Example _____

_____ **[6]**

4(a). A small manufacturing business uses networked computers with closed source application software installed.

Each computer the business uses has a BIOS.

Tick (✓) **one** box in each row to identify whether each statement in the table is true or false.

Statement	True	False
BIOS stands for Boot Input Output Standard		
The BIOS can be used to alter hardware settings, such as which storage device the computer boots from		
BIOS settings are stored in RAM		

[3]

(b). The business uses virtual storage to hold regular backups of all of its data.

Explain why virtual storage is well-suited for storing backups.

_____

_____

_____

_____ **[2]**

(c). One computer owned by the business monitors critical-safety features of manufacturing. All input data must be processed within a predictable timescale of a fraction of a second.

i. State the type of operating system that should be used by this computer.

_____

[1]

ii. Give the name of **three** other types of operating system, and for each state its purpose.

Type 1 _____

_____

Purpose 1 _____

_____

Type 2 _____

_____

Purpose 2 _____

_____

Type 3 _____

_____

Purpose 3 _____

[6]

(d). When a device such as a keyboard or printer requires attention from the CPU, an interrupt is raised.

Explain how an operating system deals with an interrupt.

[3]

(e). Memory management is a key function of an operating system. Explain how an operating system can manage the memory available to applications and why doing so is important.

You should include the following in your answer:

- the different actions carried out by an operating system to manage memory
- how memory that is being managed can be split up
- why memory management is important.

[9]

5. A computer system will contain several input and output devices.

Explain the role of device drivers when using input and output devices on a computer system.

[2]

6. Anika's computer runs a multi-tasking operating system. She has access to a printer and a broadband internet connection through a wireless connection. The operating system uses scheduling algorithms such as first come first served and round-robin.

i. Explain why the computer's operating system uses a first come first served algorithm when sending documents to the printer.

[2]

ii. Explain why the computer's operating system uses a round-robin algorithm for allocating processor time.

[3]

iii. Describe **one** other scheduling algorithm.

[2]

7(a). One role of an operating system is the Interrupt Service Handler. This allows processes being executed by the CPU to be interrupted.

i. One example of an interrupt would be removing an external hard disk drive from a computer.

State why this would need to interrupt the current fetch-decode-execute cycle of the CPU.

[1]

ii. Interrupt Service Handlers make use of a stack data structure.

Describe how a stack is used when handling interrupts.

[2]

(b). Arnold has several computing devices around his home. Each device has an operating system installed.

Arnold has a PC which has a Basic Input Output System (BIOS).

Describe what is meant by the term 'BIOS'.

[2]

(c). Arnold has a router. It will receive data packets from other computers on Arnold's network or the internet and then route them on to the next step.

The scheduling algorithm Arnold's router uses is First Come First Served.

i. State the name of **one** other scheduling algorithm.

[1]

ii. Explain why First Come First Served is a suitable scheduling algorithm for Arnold's router.

[2]

(d). One role of an operating system is to manage the computer's memory.

Two types of memory management are paging and segmentation.

Describe **one** difference between paging and segmentation.

[2]

8(a). Operating systems usually come with utility software pre-installed.

Give **two** examples of utility software, explaining the purpose of both.

1

2

[4]

(b). Imogen buys a desktop computer. It comes with an operating system installed.

i. Describe **two** ways that an operating system could manage physical memory.

1

2

[4]

ii. Explain **one** benefit of memory management to the user.

[2]

iii. Describe how virtual memory allows a user to run programs when physical memory is full.

[2]

(c). Operating systems make use of device drivers.

Define what is meant by the term 'device driver', giving one example of a device driver that a home user would need.

Definition

Example

[3]

9(a). Julie is a university student. She is considering buying a laptop to help with her studies both at home and university. Her friend has told her she will need to choose an operating system to run on her laptop.

Two functions of an operating system are memory management and scheduling.

State **two** other functions of an operating system.

1

2

[2]

(b). The operating system Julie is considering makes use of paging to manage the laptop's memory.

Explain **one** benefit of using paging for this purpose.

[2]

(c). Julie's friend has told her she should buy a laptop with a solid-state drive that uses flash technology rather than a magnetic hard drive.

Explain **two** reasons why Julie would use flash technology to store her files.

1

2

[4]

(d). State the name of **one** utility that Julie could install on her laptop.

[1]

END OF QUESTION PAPER