GCST

1.2.1
OPERATING SYSTEMS
TOPIC WISE EXAM QUESTIONS

A-LEVEL OCR

GCST

SPEC

1.2.1 Operating Systems	a) The need for, function and purpose of operating systems. b) Memory management (paging, segmentation and virtual memory). c) Interrupts, the role of interrupts and Interrupt Service Routines (ISR), role within the fetch decode execute cycle. d) Scheduling: round robin, first come first served, multi-level feedback queues, shortest job first and shortest remaining time. e) Distributed, embedded, multi-tasking, multi-user and real time operating systems. f) BIOS. g) Device drivers. h) Virtual machines, any instance where software is used to take on the function of a machine, including executing intermediate code or running an operating system within another.	Candidates need to have an understanding of why an operating system is required, along with the different tasks it performs within a computer system (e.g. resource management, file management, interrupt handling, security, providing a platform for software to run, providing a user interface and providing utilities). Candidates need to understand how operating systems manage memory. They need to understand the need for, purpose and function of paging to divide memory into usable fixed-size pages and how this aids in the transfer of memory for example virtual memory. Candidates need to understand what is meant by segmentation and how memory is divided into segments to allow access to memory. Candidates need to understand what is meant by virtual memory and why this is needed in a computer system. Candidates need to understand how paging is used in virtual memory, and the benefits and drawbacks of having and using virtual memory in a computer system. Candidates need to understand the purpose of interrupts within a computer system, why an interrupt might be generated and what happens within the CPU and memory in order to call an interrupt service routine. Candidates need to understand the need for scheduling of tasks by an operating system and the benefits that scheduling brings. Candidates need to understand that there are different scheduling algorithms, with each having benefits and drawbacks for tasks with specific characteristics. Candidates need to understand how the following scheduling algorithms work; round robin, first come first served, multi-level feedback queue, shortest job first and shortest remaining time. Candidates need to understand the different (and often overlapping) classifications of operating systems (distributed, embedded, multi-tasking, multi-user and real time), including the key features of each. They should be able to recommend (and justify) a type of operating system for a given scenario. Candidates need to understand the role of the BIOS in a computer system, and the steps that the BIOS goes through to start a computer. Candidates need to understand what is meant by 'device drivers' and why they are needed for communication between hardware and the operating system. Candidates should be able to describe what is meant by a virtual machine, how they can be used to execute intermediate code, how they can be used to run a software driven machine inside a physical machine and the benefits and drawbacks of each approach.

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2023

1 **(e)** 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.

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..... **[1]**

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

Type 1 .....

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Purpose 1 .....

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Type 2 .....

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Purpose 2 .....

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Type 3 .....

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Purpose 3 .....

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[6]

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

(f) Explain how an operating system deals with an interrupt.

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..... **[3]**

(g)* 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]**

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AS - Level

1 **(d)** The 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.

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..... **[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.

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

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..... [2]

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

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

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AS - Level

1 Arnold has several computing devices around his home. Each device has an operating system installed.

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

Describe what is meant by the term 'BIOS'.

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..... **[2]**

(b) 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.

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..... **[1]**

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

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..... **[2]**

(c) 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.

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..... **[2]**

(e) Another 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.

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..... **[1]**

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

Describe how a stack is used when handling interrupts.

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..... **[2]**

9 (a) 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 .....

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2 .....

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..... **[4]**

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

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..... **[2]**

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

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..... **[2]**

Operating systems make use of device drivers.

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

Definition .....

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Example .....

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2 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.

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

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

1 .....

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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.

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1 A company releases an in-home virtual assistant called 'Bertie Butler'.

The device, when placed in a room, listens out for the phrase "Hey Bertie". When someone says that phrase it then listens to the question that follows and tries to give a relevant answer.

The Bertie Butler device runs off an embedded operating system.

(b) Define the term 'embedded operating system'.

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6 **(d)** Explain why the programmers of anti-virus software may make use of virtual machines when developing the updates.

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When running the anti-virus software, an operating system uses a scheduling algorithm to determine an allocation of CPU time to the anti-virus software.

(e) Explain why a First Come First Served scheduling algorithm would **not** be suitable in this situation.

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..... **[2]**

In the late 1990s the CIH virus hit headlines because it was able to overwrite and destroy the contents of a computer's BIOS.

(f) Describe what the effect would be of a computer having its BIOS overwritten.

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..... **[2]**

Linux is a popular open source operating system and Windows is a popular closed source operating system.

(d) Give **three** functions of an operating system.

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2 .....

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3 .....

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[3]

2 A software company decides to build an operating system for OCR smart watches.

(a) Memory management is one of the functions of an operating system.

(i) List **three** functions, other than memory management, of an operating system.

1 .....

2 .....

3 .....

[3]

Part of a computer's memory is represented below (Fig. 2). The operating system divides the memory into equally sized chunks.

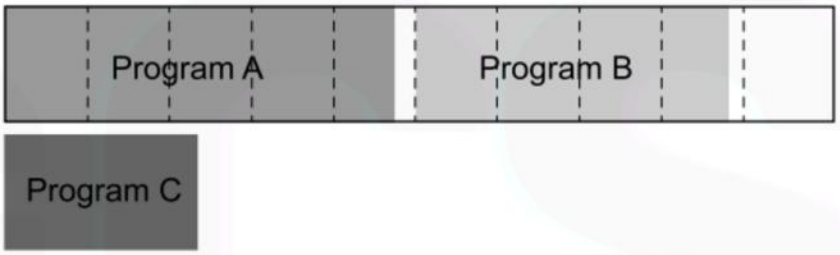

Fig. 2

(ii) State the name of the type of memory management used in Fig. 2.

..... **[1]**

(iii) The operating system needs to load program C into memory but there is not enough space. Describe how the operating system would use virtual memory to load program C.

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..... **[3]**

7 A taxi firm is investigating replacing its drivers with self-driving cars.

(a) Explain why the self-driving system will use a real-time operating system.

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..... **[3]**

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AS - Level

1 A company produces digital photo frames (i.e. photo frames that display digital photographs).

(a) Identify the type of operating system that the photo frame is most likely to use.

Operating system	Tick one
Distributed	
Embedded	
Multi-user	

[1]

2 **(c)** The electricity company decides to trial smart meters. These can be connected to a computer so the user can download and analyse records of their electricity usage.

(i) In order to be able to access all the functionality of the meter, the computer needs a device driver. Describe what is meant by the term 'device driver'.

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..... **[2]**

3 The Government Communications Headquarters (GCHQ) is responsible for monitoring communications in order to keep the UK secure. A large part of its job involves trying to break into encrypted messages.

(a) The code breakers at GCHQ have access to supercomputers (computers with many processors).

Describe why a supercomputer will be useful to GCHQ.

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..... **[2]**

4 Desktop operating systems are an essential part of modern personal computer systems (i.e. desktops and laptops).

(a) Describe how a desktop operating system is loaded when a personal computer is first switched on.

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..... **[2]**

(c)* One of the key functions of an operating system in a personal computer is to manage system resources such as memory and CPU time. Discuss the different approaches a desktop operating system can take to managing these system resources and the relative advantages of each approach. **[9]**

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8* A programmer is writing a game to run on a variety of games consoles. Discuss the different ways in which they might use virtual machines in this process and any advantages and disadvantages of doing so. [9]

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GCST

2017

1 An architect firm specialises in designing skyscrapers.

(b) Each computer has a multi-tasking operating system installed.

(i) State the name of and describe **two** methods that the operating system can use to divide the contents of RAM.

Method 1

Name .....

Description .....

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Method 2

Name .....

Description .....

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[4]

(ii) Explain, giving an example, why the firm's computers use operating systems capable of multi-tasking.

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..... **[2]**

2016 AS

1 See And Believe is a company that specialises in computer-generated imagery (CGI) for films.

Producing CGI requires lots of processing power and so the company has a large number of high-performance computers.

(a) Explain why See And Believe would use a distributed operating system.

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..... **[3]**

GCST

EXTRA

1. Intensive Care Units in hospitals are for patients in need of round the clock monitoring and support. Computerised systems can be used to monitor patients' vital signs (temperature, heart rate, blood pressure and breathing). They can then alert medical professionals to any significant changes.

These systems usually run on an embedded, real-time, operating system.

(i) State what is meant by the term *real-time*.

---[1]

(ii) Explain why a real-time operating system would be suitable for Intensive Care Units.

---[2]

2(a). An operating system uses scheduling. One method of scheduling is first come, first served.

(i) Explain why the first come, first served scheduling method may **not** be efficient.

---[2]

(ii) Describe **one** other scheduling method.

---[2]

(iii) Explain why scheduling is necessary.

---[4]

(b). Explain why memory management is necessary.

---[3]

(c). Paging may be used in memory management.

Describe paging.

---[3]

4. A software development company is building an operating system for a mobile phone that is in the process of being designed.

One of the developers is responsible for writing the code for what happens when the CPU receives an interrupt. Outline what the code must do.

---[6]

If you found this useful, drop a follow to help me out!

THANK YOU!

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