OCR A Level Computer Science

1.3 Input, Output & Storage

Contents

Your notes

Input & Output Devices

What is an Input Device?

- Input devices are hardware components that allow users to interact with a computer system

- They enable the user to input data or commands into the system, which the computer then processes to produce output

Types of input devices

Name of device	Description
Keyboard	The most common input device. It allows users to input text and commands by pressing keys
Mouse	Allows users to navigate the computer screen, click on items, and perform other functions
Touchscreen	Found on smartphones, tablets, and some computers, touchscreens allow users to interact with the device by touching the screen
Microphone	Captures audio input, which can be used for voice commands, recording audio, or video conferencing
Webcam	Captures video input, often used for video conferencing or recording videos
Scanner	Digitises physical documents or images, converting them into a format that the computer can process
Game Controller	Used primarily for video games, these devices allow users to control game characters and interact with the gaming environment
Graphics Tablet	Allows artists and designers to draw or sketch directly onto a computer. It's particularly useful for graphic design, 3D modelling, and other visual creative tasks

Biometric Devices	These devices, such as fingerprint scanners or facial recognition systems, are used for security purposes to verify a user's identity
Barcode Reader	Scans barcodes, typically used in retail and inventory management
Joystick	Often used for computer games, especially flight simulators. It allows the user to control movement more fluidly than with a keyboard or mouse

What is an Output Device?

- Output devices are hardware components that receive information from a computer system and present it to the user in a comprehensible form

- They enable the computer to communicate the results of processed data or commands

Types of output devices

Name of device	Description
Monitor	This is the most common output device. It displays visual output from the computer, including text, images, and videos
Printer	Produces a hard copy of digital documents or images. There are various types of printers, including inkjet, laser, and 3D printers
Speakers	Output audio from the computer, such as music, sound effects, or voice
Headphones	Similar to speakers, headphones output audio directly to the user, providing a more personal and potentially immersive experience
Projector	Projects the computer's display onto a large screen or wall, useful for presentations or movie viewing
Braille Display	This specialised device outputs information in Braille, allowing visually impaired users to read text from the computer
Plotter	Used for printing large, high-quality diagrams and designs, often used in engineering or architecture

Virtual Reality (VR) Headset	Provides an immersive visual and audio output, primarily used for gaming and virtual simulations
Computer-Controlled Machinery	In manufacturing or robotics, computers often output commands directly to machinery to control their operation

Choosing the right device

When recommending a device for a specific situation, consider the following factors:

- User Needs

  - What tasks will the user be performing? A graphic designer might need a graphics tablet, while a data entry clerk might need a keyboard with a number pad

- User Skills

  - Is the user comfortable with the device? A touch screen might be more intuitive for some users, while others might prefer a mouse and keyboard

- Environment

  - Where will the device be used? A wireless mouse might be suitable for a clutter-free office, while a wired mouse might be better for a public computer lab to prevent theft

- Cost

  - Higher-end devices often have more features but are also more expensive. Consider the budget and whether the extra features are worth the cost

Secondary Storage Devices

- Storage devices are hardware components that retain digital data within a computer system

- They provide a means of storing, accessing, and retrieving data, which can include software applications, documents, images, videos, and more

- There are 3 types of storage:

  - **Magnetic**

  - **Optical**

  - **Flash**

Type of Storage	Description	Benefits	Drawbacks

Device			
Magnetic Storage Devices (e.g., Hard Disk Drives, Magnetic Tape Drives)	Store data by magnetising particles on a disk or tape.	High storage capacity; relatively low cost per gigabyte; suitable for long-term storage and backup.	Slower read/write speeds compared to other types; susceptible to physical damage; moving parts can wear out over time.
Optical Storage Devices (e.g., CDs, DVDs, Blu-ray Discs)	Store data using a laser to burn pits into the surface of the disc.	Durable and relatively immune to environmental conditions; easy to transport; suitable for distributing software, music, or movies.	Lower storage capacity compared to other types; slower read/write speeds; can be easily scratched or damaged.
Flash Storage Devices (e.g., Solid-State Drives, USB Flash Drives)	Store data in flash memory cells.	Fast read/write speeds; no moving parts, so less likely to fail due to physical shock; silent operation.	Higher cost per gigabyte; flash memory cells can wear out after a certain number of write cycles.

Here are some of the devices commonly used for storage:

Name of Device	Type of Device	Typical Storage Capacity	Affordability	Portability	Durability
Hard Disk Drive (HDD)	Magnetic	500GB - 2TB (consumer-grade)	Low cost per GB	Low (especially for internal HDDs)	Moderate (susceptible to damage from shocks or falls due to moving parts)
Solid-State Drive (SSD)	Flash	120GB - 4TB (consumer-grade)	High cost per GB	High (especially for external SSDs)	High (no moving parts, less susceptible to physical shock)

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USB Flash Drive	Flash	8GB – 256GB (common sizes)	Moderate cost per GB	Very High (small and lightweight)	Moderate (can withstand casual handling, but can be lost or damaged if not cared for)
CD/DVD/Blu-ray Disc	Optical	CD: 700MB, DVD: 4.7GB – 9GB, Blu-ray: 25GB – 50GB	Low cost per disc	High (thin and lightweight)	Low (can be scratched or damaged easily)

Choosing the right storage device

When recommending a storage device for a specific situation, consider the following factors:

- Storage Needs

  - How much data does the user need to store? A user with large amounts of data might need a high-capacity HDD, while a user who only needs to store a few documents might be fine with a USB flash drive

- Performance Needs

  - Does the user need fast access to their data? An SSD might be best for tasks that require high-speed data access, like video editing or gaming

- Portability

  - Does the user need to transport the data? USB flash drives and external HDDs or SSDs are portable and can be used to transfer data between different computers

- Cost

  - Higher-capacity and faster storage devices are generally more expensive. Consider the user's budget and whether their storage and performance needs justify the extra cost

Virtual Storage

What is virtual storage?

- Virtual storage, also known as cloud storage, refers to a model of data storage where digital data is stored across multiple servers and locations, typically hosted by third parties e.g. Microsoft, Google, Apple

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- While the storage may appear to be local from the user's perspective, the data is physically located elsewhere, often distributed across a network of servers

Why is there a need for virtual storage?

- In the digital age, the amount of data generated and used by businesses and individuals is growing exponentially

- Storing all this data on local devices can be impractical due to limitations in storage capacity and the risk of data loss

- Virtual storage provides a solution to these challenges by offering scalable, off-site storage with built-in redundancy and backup

How does virtual storage work?

- When you use virtual storage, your data is transmitted over the internet to a data centre

- This data centre uses servers to store your data, which can be accessed and retrieved as needed. These servers are maintained by the cloud storage provider, who ensures that the data is secure, backed up, and available for access

Benefits of Virtual Storage	Drawbacks of Virtual Storage
Scalability: Easy to increase storage capacity as needs grow.	**Dependence on Internet Connection**: Access to data can be slow or impossible with a poor Internet connection.
Accessibility: Data can be accessed from anywhere with an internet connection.	**Security Concerns**: Storing sensitive data off-site can pose a risk, despite the provider's security measures.
Data Protection: Data redundancy protects against data loss due to hardware failure.	**Ongoing Costs**: While cost-effective, virtual storage is an ongoing expense and costs can add up over time.
Cost-Effective: Pay only for the storage used, often more affordable than maintaining own storage infrastructure.	

Examiner Tips and Tricks

- Don't get mixed up between virtual storage and virtual memory

  - Virtual storage is data which is stored virtually (on the cloud)
  - Virtual memory is utilising secondary storage as RAM when the computer is maximizing RAM

Your notes

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RAM & ROM

RAM & ROM

What are the Differences between RAM & ROM?

RAM (Random Access Memory)

- RAM stores data that is currently being used by the computer, such as open applications and files

- The data in RAM can be read from and written to by the processor, allowing for fast data access and manipulation

- RAM is volatile, which means it loses its contents when the computer is turned off or restarted

- It's also directly accessible, meaning the processor can access any part of the RAM equally fast, hence the name "Random Access Memory"

- In all types of computers, from desktops to mobile devices to embedded systems, RAM plays a crucial role in the system's speed and performance. The more RAM a system has, the more data it can process simultaneously, leading to faster performance

ROM (Read-Only Memory)

- ROM stores the BIOS (Basic Input/Output System) or firmware that is used to start up the computer and initialise the hardware components. This data is essential for the computer to function and needs to be preserved even when the computer is turned off

- ROM is non-volatile, meaning it retains its contents even when the computer is turned off. As its name suggests, data stored in ROM can be read by the computer but not written to or modified

- In all types of computers, ROM is essential for system startup. E.g. in mobile devices, ROM might contain the bootloader that starts the device and loads the operating system

Comparing RAM and ROM

	RAM (Random Access Memory)	ROM (Read-Only Memory)
Purpose	Stores data currently being used by the computer, such as open applications and files.	Stores the BIOS or firmware used to start up the computer and initialise hardware components.

Characteristics	Volatile	Non-volatile

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