Computer Science (OCR J277)

Keywords and definitions for paper 1

1.1.1 – Architecture of a CPU

Keyword	Definition
Central Processing Unit (CPU)	The CPU is the main processor in a computer that fetches, decodes and executes instructions.
Fetch-Decode-Execute Cycle (FDE Cycle)	The repeated process where the CPU fetches an instruction from memory, decodes it to understand what to do, and executes it.
Arithmetic Logic Unit (ALU)	A component of the CPU that performs arithmetic calculations (e.g. addition, subtraction) and logical operations (e.g. AND, OR, NOT).
Control Unit (CU)	The part of the CPU that controls the fetch-decode-execute cycle and manages the flow of data between components.
Program Counter (PC)	A register that stores the memory address of the next instruction to be fetched and executed.
Memory Address Register (MAR)	A register that holds the address of the data or instruction the CPU wants to access in memory.
Memory Data Register (MDR)	A register that temporarily stores data or instructions being transferred between memory and the CPU.
Accumulator (ACC)	A register that stores the results of calculations carried out by the ALU.
Cache	A small, very fast memory located inside the CPU that stores frequently used data and instructions.
Random Access Memory (RAM)	Primary storage that temporarily holds data and instructions currently being used by the computer. It is volatile memory.

1.1.2 – CPU Performance

Keyword	Definition
Clock Speed	The number of Fetch-Decode-Execute cycles a CPU can perform per second, measured in Hertz (Hz).
2. Hertz (Hz)	A unit of frequency. In computing, 1 Hz equals one complete Fetch-Decode-Execute cycle per second.
Gigahertz (GHz)	One billion (1,000,000,000) cycles per second. Used to measure modern processor clock speeds.
Cache	A small, high-speed memory inside the CPU that stores frequently used data and instructions.
L1 Cache	The smallest and fastest level of cache, located closest to the CPU core.
L2 Cache	A medium-sized cache that is slightly slower than L1 but larger in capacity.
L3 Cache	The largest and slowest level of cache within the CPU, but still faster than RAM.
Core	An individual processing unit within a CPU that can independently execute instructions.
Multi-Core Processor	A CPU that contains two or more cores, allowing multiple instructions to be processed simultaneously.
Overclocking	Increasing a processor's clock speed beyond its standard setting to improve performance.

1.1.3 – Embedded Systems

Keyword	Definition
Embedded System	A computer system built into a larger device that performs a specific programmable function.
Programmable Function	A task carried out according to coded instructions stored within the system.
Larger System	The main device that an embedded system is built into (e.g. a car, microwave, or smartphone).
Firmware	Software permanently programmed into a chip that controls an embedded system.
Dedicated System	A system designed to perform one specific task rather than multiple general-purpose tasks.
Smart Device	A device enhanced by embedded systems to perform automated or programmable functions.
Microcontroller	A small processor used inside embedded systems to control specific functions.
Automation	The use of technology to perform tasks automatically without human intervention.
Cost-Efficient Design	Using only the necessary components to perform a specific function, reducing cost.
Specific Purpose Computing	Computing designed to carry out one defined role rather than a range of different tasks.

1.2.1 – Primary Storage

Keyword	Definition
Primary Storage	Memory directly accessed by the CPU.
RAM	Volatile memory storing data currently in use.
ROM	Non-volatile memory storing startup instructions.
Volatile Memory	Data lost when power is removed.
Non-Volatile Memory	Data retained without power.
BIOS	Startup program stored in ROM.
Virtual Memory	Secondary storage used when RAM is full.
Loading	Moving data from storage into RAM.
Saving	Moving data from RAM to secondary storage.
Configuration Settings	System setup data stored in ROM.

1.2.2 – Secondary Storage

Keyword	Definition
Secondary Storage	Non-volatile storage used for long-term data.
Non-Volatile	Data remains when power is off.
Hard Disk Drive (HDD)	Magnetic storage device.
Solid State Drive (SSD)	Flash-based storage with no moving parts.
Optical Storage	Storage using lasers (CD/DVD/Blu-ray).
Flash Memory	Solid-state storage using transistors.
Backup	Copy of data stored separately.
Magnetic Storage	Uses magnetic polarity to store data.
Optical Media	Uses pits and lands to represent binary.
Solid State Media	Storage with no moving mechanical parts.

1.2.3 – Units

Keyword	Definition
Bit	Smallest unit of data (0 or 1).
Byte	8 bits.
Kilobyte (KB)	1,000 bytes.
Megabyte (MB)	1,000,000 bytes.
Gigabyte (GB)	1,000,000,000 bytes.
Terabyte (TB)	1,000,000,000,000 bytes.
Petabyte (PB)	1,000,000,000,000,000 bytes.
Metadata	Extra data stored within files.
File Size Formula (Text)	Bits per character × number of characters.
Mbps vs MBps	Megabits per second vs Megabytes per second.

1.2.4a Data Storage: Numbers

Keyword	Definition
Binary	Base 2 number system using 0 and 1.
Denary	Base 10 number system used in everyday counting.
Hexadecimal	Base 16 number system (0–9, A–F).
8-bit Binary	Binary number stored using 8 bits.
Binary Addition	Adding binary numbers using carry rules.
Binary Shift	Moving bits left (×2) or right (÷2).
Overflow	Error when a number exceeds available bits.
Most Significant Bit (MSB)	Leftmost bit.
Least Significant Bit (LSB)	Rightmost bit.
Check Digit	Extra digit used to detect data entry errors.

1.2.4b – Data Storage: Characters

Keyword	Definition
Character Set	A system that maps binary values to characters.
ASCII	7-bit character set supporting 128 characters.
Extended ASCII	8-bit character set supporting 256 characters.
Unicode	Character set using 16 bits or more supporting thousands of characters.
Binary Code	Representation of data using 1s and 0s.
Denary	Base 10 number system.
Compatibility	Ability to correctly display text across systems.
Encoding	Converting characters into binary.
File Size (Text)	Bits per character × number of characters.
Character Map	Table linking numbers to characters.

1.2.4c – Data Storage: Images

Keyword	Definition
Pixel	A single dot of colour in a digital image.
Resolution	The number of pixels in an image (width × height).
Colour Depth	The number of bits used to represent a pixel's colour.
RGB	Red, Green and Blue colour model used in digital images.
Metadata	Data about a file (e.g. creation date, resolution).
True Colour (24-bit)	8 bits per RGB channel allowing 16.7 million colours.
Pixelation	Blocky appearance caused by low resolution.
Image Height	Number of vertical pixels.
Image Width	Number of horizontal pixels.
File Size Calculation (Image)	Colour depth × height × width (+ metadata).

1.2.4d – Data Storage: Sound

Keyword	Definition
Sample	A single measurement of an analogue sound wave.
Sample Rate	The number of samples taken per second (measured in Hz).
Bit Depth	The number of bits used to store each audio sample.
Frequency (Hz)	The number of times something occurs per second.
Mono	Single audio channel recording.
Stereo	Two audio channels recording.
Amplitude Resolution	The accuracy of the height of the sound wave stored.
Digital Audio	Sound stored as binary data.
Audio Channels	Separate streams of sound data.
File Size Calculation (Sound)	Sample rate × duration × bit depth × channels.

1.2.5 – Compression

Keyword	Definition
Compression	The process of reducing a file's size to make it easier to store or transfer.
Lossy Compression	A compression method that permanently removes some data to reduce file size.
Lossless Compression	A compression method that reduces file size without removing data.
Decompression	The process of restoring a compressed file back to usable form.
File Size	The amount of storage space a file requires, measured in bits or bytes.
Quality Loss	Reduction in image, sound or data accuracy due to lossy compression.
Redundant Data	Repetitive data that can be removed or encoded more efficiently.
Algorithm	A set of rules used to compress or decompress data.
Suitability	Choosing the correct compression method for a specific purpose.
Transfer Time	The time taken to send a file between devices.

1.3.1 – Networks and topologies

Keyword	Definition
Network	A group of computers and devices connected together so they can communicate and share resources.
LAN (Local Area Network)	A network that connects computers within a small geographic area such as a home, school, or office.
WAN (Wide Area Network)	A network that connects computers across large geographic areas, often linking multiple LANs together.
Network Performance	How efficiently a network operates, usually measured by speed, reliability, and data transfer capability.
Bandwidth	The maximum amount of data that can be transferred across a network in a given time.
Latency	The delay between sending and receiving data across a network.
Data Traffic	The amount of data moving through a network at any given time.
Client–Server Network	A network where client computers request services and resources from a central server.
Peer-to-Peer Network (P2P)	A network where each computer can act as both a client and a server, sharing resources directly with others.
Server	A computer that provides services, resources, or data to other computers on a network.
Client	A computer that requests services or resources from a server.
Network Hardware	Physical devices used to build and operate a computer network.
Router	A device that directs data packets between different networks, often connecting a LAN to the internet.
Switch	A device that connects multiple devices within a LAN and sends data to the correct destination device.
Wireless Access Point (WAP)	A device that allows wireless devices to connect to a wired network using Wi-Fi.
Network Interface Card (NIC)	A hardware component that allows a computer to connect to a network.
Transmission Media	The physical path used to transmit data between devices in a network.
Ethernet Cable	A common wired transmission medium used to connect devices in a LAN.
Fibre Optic Cable	A high-speed cable that uses light signals to transmit data over long distances.
Wireless Communication	The transmission of data without cables using radio waves, such as Wi-Fi.
Internet	A global system of interconnected networks that allows computers worldwide to communicate.
Domain Name System (DNS)	A system that translates human-readable website names into IP addresses used by computers.

Web Server	A server that stores and delivers web pages to users through the internet.
Web Client	A device or software (such as a web browser) that requests web pages from a web server.
Hosting	A service that stores websites or applications on servers so they can be accessed on the internet.
Cloud Computing	The delivery of computing services such as storage and software over the internet instead of locally.
Network Topology	The physical or logical layout of how devices are connected in a network.
Star Topology	A network layout where all devices are connected to a central device such as a switch or hub.
Mesh Topology	A network layout where devices are interconnected with multiple pathways for data.
Data Packets	Small pieces of data that are transmitted across a network and reassembled at the destination.

1.3.2 – Wired and wireless networks, protocols and layers

Keyword	Definition
Wired Connection	A network connection that uses physical cables to transmit data between devices.
Ethernet	A common wired networking technology used in LANs that sends data through Ethernet cables.
Wireless Connection	A network connection that transmits data using radio signals instead of cables.
Wi-Fi	A wireless networking technology that allows devices to connect to a network and the internet using radio waves.
Bluetooth	A short-range wireless technology used to connect devices such as headphones, keyboards, and phones.
Encryption	The process of converting data into a coded form so that only authorised users can read it.
IP Address	A unique numerical identifier assigned to a device on a network so it can be identified and communicated with.
MAC Address	A unique hardware address assigned to a network interface card (NIC) used to identify a device on a local network.
Network Standards	Agreed rules and specifications that ensure devices and networks can communicate and operate together properly.
Protocol	A set of rules that define how data is transmitted and received across a network.
TCP/IP	A set of communication protocols used to connect devices on the internet and manage how data packets are transmitted.
HTTP	A protocol used for transferring web pages from a web server to a web browser.
HTTPS	A secure version of HTTP that encrypts data to protect communication between a browser and a website.
FTP	A protocol used to transfer files between computers over a network.
POP (Post Office Protocol)	A protocol used by email clients to download emails from a mail server to a local device.
IMAP (Internet Message Access Protocol)	An email protocol that allows users to access and manage emails directly on the mail server.
SMTP (Simple Mail Transfer Protocol)	A protocol used to send emails from a client to a mail server or between mail servers.
Network Layers	The concept of dividing network communication into separate layers, each responsible for a specific task.

1.4.1 - Threats to computer systems and networks

Keyword	Definition
Cyber Attack	An attempt to gain unauthorised access to a computer system or network in order to steal, damage, or disrupt data and services.
Malware	Malicious software designed to damage, disrupt, or gain unauthorised access to computer systems.
Virus	A type of malware that attaches itself to files or programs and spreads when they are opened or shared.
Worm	Malware that can replicate itself and spread across networks without needing to attach to another file.
Trojan Horse	Malware disguised as legitimate software that tricks users into installing it.
Spyware	Malware that secretly collects information about a user's activities without their knowledge.
Ransomware	Malware that blocks access to a system or files until a ransom payment is made.
Social Engineering	Manipulating people into revealing confidential information or performing actions that compromise security.
Phishing	A type of social engineering where attackers send fake emails or messages to trick users into revealing personal information.
People as the Weak Point	The idea that human error or lack of awareness is often the easiest way for attackers to gain access to systems.
Brute-force Attack	A hacking method where attackers repeatedly try many password combinations until the correct one is found.
Denial of Service (DoS) Attack	An attack that floods a server or network with traffic so it becomes slow or unavailable to users.
Distributed Denial of Service (DDoS)	A DoS attack carried out using multiple computers to overwhelm a target system.
Data Interception	The act of secretly capturing data while it is being transmitted across a network.
Data Theft	The unauthorised copying or stealing of sensitive information such as personal data or company records.
SQL Injection	An attack where malicious SQL code is inserted into a database query to access, modify, or delete data.

1.4.2 - Identifying and preventing vulnerabilities

Keyword	Definition
Cybersecurity	The practice of protecting computer systems, networks, and data from cyber attacks and unauthorised access.
Penetration Testing	A security test where ethical hackers attempt to break into a system to identify vulnerabilities before real attackers do.
Anti-Malware Software	Software designed to detect, prevent, and remove malicious software such as viruses, worms, and spyware.
Firewall	A security system that monitors and controls incoming and outgoing network traffic based on security rules.
User Access Levels	Permissions that control what users can see, access, or modify within a system.
Administrator	A user with the highest level of access who can manage systems, users, and security settings.
Standard User	A user with limited permissions who can use the system but cannot make major changes.
Password	A secret combination of characters used to verify a user's identity when accessing a system.
Strong Password	A password that is difficult to guess because it contains a mix of letters, numbers, and special characters.
Encryption	The process of converting data into a coded format so only authorised users can read it.
Physical Security	Measures used to protect hardware and systems from physical access or damage.
Security Locks	Physical locks used to prevent unauthorised access to computer equipment or server rooms.
Biometric Security	Security systems that use unique physical characteristics such as fingerprints or facial recognition to verify identity.
CCTV	Surveillance cameras used to monitor and protect buildings and equipment from theft or unauthorised access.

1.5.1 - Operating Systems

Keyword	Definition
Operating System (OS)	System software that manages computer hardware and software resources and provides services for applications.
User Interface (UI)	The way a user interacts with a computer system, allowing them to give commands and receive output.
Graphical User Interface (GUI)	A type of user interface that allows users to interact with the computer using icons, windows, and menus.
Command Line Interface (CLI)	A text-based interface where users type commands to interact with the operating system.
Memory Management	The process of controlling and coordinating the computer's main memory (RAM) so programs run efficiently.
Multitasking	The ability of an operating system to run multiple programs or processes at the same time.
Process	A program that is currently being executed by the computer.
Peripheral Device	External hardware devices connected to a computer, such as printers, keyboards, and scanners.
Peripheral Management	The operating system's control and coordination of peripheral devices connected to the computer.
Device Driver	A piece of software that allows the operating system to communicate with and control hardware devices.
User Management	The process of controlling user accounts, permissions, and access to system resources.
User Account	A profile that allows a person to log into a computer system with specific permissions.
File Management	The organisation, storage, retrieval, and management of files on a computer system.
File System	The structure used by an operating system to organise and store files on storage devices.
Directory (Folder)	A container used to organise and store files within a file system.

1.5.2 - Utility software

Keyword	Definition
Utility Software	System software designed to help maintain, manage, and optimise a computer system.
Utility System Software	Programs that perform maintenance tasks to keep the computer running efficiently and securely.
Encryption Software	Software that converts data into a coded format so that only authorised users can access it.
Defragmentation	The process of reorganising fragmented data on a storage device so files are stored in continuous sections, improving performance.
Disk Defragmenter	A utility program that rearranges fragmented files on a hard disk to speed up file access.
Data Compression	The process of reducing the size of files so they take up less storage space and can be transferred more quickly.
Lossless Compression	A type of compression where the original data can be perfectly reconstructed after decompression.
Lossy Compression	A type of compression that removes some data permanently to reduce file size, often used for images, audio, and video.
File Archiving	Storing files in a compressed format for backup or long-term storage.
System Maintenance	Tasks performed by utility software to keep the computer system stable, efficient, and secure.

1.6.1 – Ethical, legal, cultural and environmental impact of digital technology

Keyword	Definition
Digital Technology	Electronic tools, systems, and devices that generate, store, or process data, such as computers, smartphones, and the internet.
Ethical Issues	Moral concerns about how technology is used, including fairness, responsibility, and the potential harm caused by technology.
Legal Issues	Laws and regulations that control how digital technology and data can be used.
Cultural Issues	The ways digital technology affects people's behaviours, lifestyles, and communication within societies.
Environmental Issues	The impact technology has on the environment, including energy consumption, electronic waste (e-waste), and resource use.
Privacy Issues	Concerns about how personal information is collected, stored, and used by organisations and online services.
Data Protection	The practice of safeguarding personal data to ensure it is used fairly, securely, and legally.
The Data Protection Act 2018	UK law that controls how personal data is collected, processed, and stored, giving individuals rights over their data.
Personal Data	Information that can identify an individual, such as name, address, email, or phone number.
Computer Misuse	The act of using computers or networks illegally, such as hacking or spreading malware.
Computer Misuse Act 1990	UK law that makes unauthorised access to computer systems and data illegal.
Copyright	Legal protection that gives creators control over how their work is copied, shared, or used.
Copyright Designs and Patents Act 1988	UK law that protects original creative works such as software, music, films, and books.
Software Licence	A legal agreement that explains how software can be used, copied, or distributed.
Open Source Software	Software where the source code is publicly available and can be modified or shared by anyone.
Proprietary Software	Software owned by a company or individual where the source code is not publicly available and usage is restricted by a licence.