Chapter wise notes and possible question which come in exam

1. Computer Fundamentals

1.1 Definition, History, Generation, Characteristics, Types & Applications of Computers

Definition: A computer is an electronic device that accepts input (data), processes it according to a given set of instructions (program), produces output (information), and can store data for future use.

History:

- Ancient calculating devices: Abacus
- 19th Century: Charles Babbage designed the Analytical Engine (known as the **Father of the Computer**)
- 1940s: ENIAC – the first general-purpose electronic digital computer
- 1951: UNIVAC – the first commercial computer

Generations of Computers:

Generation	Period	Technology Used	Key Features	Example
First	1940–1956	Vacuum Tubes	Large size, high power consumption	ENIAC, UNIVAC
Second	1956–1963	Transistors	Smaller, faster, less heat	IBM 1401
Third	1964–1971	Integrated Circuits	More reliable, smaller size	IBM 360
Fourth	1971–Present	Microprocessor	Personal Computers, GUI	Intel 4004, Pentium
Fifth	Present	AI & Parallel Processing	Natural language, expert systems	AI-based systems

Characteristics of Computers:

- High Speed
- Accuracy
- Storage Capacity
- Versatility (multi-purpose)
- Diligence (no fatigue)
- Automation

Types of Computers:

- **According to Size**: Supercomputer, Mainframe, Minicomputer, Microcomputer (PC), Workstation
- **According to Data Processing**: Analog, Digital, Hybrid
- **According to Purpose**: General Purpose and Special Purpose

Applications of Computers:

- Education (e-learning), Healthcare, Banking, E-Governance, Business, Scientific Research, Entertainment, Communication

1.2 Overview of a Computer System

1.2.1 Data and Data Processing

- **Data**: Raw facts and figures (e.g., 101, Ram, 15/05/2005)
- **Data Processing**: Converting raw data into meaningful information
- **Information**: Processed and useful data

1.2.2 Hardware Definition: All physical parts of a computer that can be seen and touched.

- **Input Unit**: Devices used to enter data into the computer. Examples: Keyboard, Mouse, Scanner, Microphone, Webcam
- **CPU (Central Processing Unit)**: The brain of the computer.
  - **ALU (Arithmetic Logic Unit)**: Performs arithmetic and logical operations.
  - **Control Unit (CU)**: Controls and coordinates all operations.
  - **Memory Unit**: Stores data temporarily during processing.
- **Output Unit**: Devices that display or produce results. Examples: Monitor, Printer, Speaker, Projector
- **Storage Devices**:
  - **Primary Memory**: RAM (volatile, fast), ROM (non-volatile)
  - **Auxiliary/Secondary Memory**: HDD, SSD, Pen Drive, CD/DVD, Cloud Storage

1.2.3 Software Definition: A set of instructions that tells the hardware what to do. Software is intangible.
Types of Software:

1. **System Software**: Manages hardware (e.g., Operating System, Device Drivers, Utility Software)
2. **Application Software**: Used by end users (e.g., MS Word, Excel, PowerPoint, Web Browser)
3. **Programming Software**: Tools to develop software (Compiler, Interpreter, Debugger)

Programming Languages and Its Types:

- Machine Language (1st Generation – Binary code)
- Assembly Language (2nd Generation – Mnemonics)
- High-Level Language (3rd Generation – C, Java, Python)
- 4GL and 5GL (SQL, AI-based languages)

1.2.4 Firmware and Cache Memory

- **Firmware**: Software that is permanently stored in hardware (embedded software). Example: BIOS (Basic Input Output System) / UEFI
- **Cache Memory**: Very high-speed memory located inside or near the CPU. It stores frequently used data for quick access. Types: L1, L2, L3 Cache

1.3 Concept of Multimedia

Multimedia is the integration of multiple forms of media such as **text, graphics, audio, video, and animation** into a single presentation.

Elements of Multimedia:

- Text
- Graphics/Images
- Audio
- Video
- Animation

Applications: E-learning, presentations, e-governance (video notices), medical training, entertainment, and advertising.

1.4 File Management

1.4.1 Physical Structure of the Disk A disk is divided into **Tracks**, **Sectors**, **Cylinders**, and **Clusters**.

1.4.2 Concept of File and Folder

- **File**: A collection of related data stored as a single unit (e.g., report.docx).
- **Folder (Directory)**: A container used to organize files and other folders.

1.4.3 Types of Files and File Extensions Common file types and extensions:

- .docx → Microsoft Word Document
- .xlsx → Microsoft Excel Workbook
- .pptx → Microsoft PowerPoint Presentation
- .pdf → Portable Document Format
- .jpg / .png → Image files
- .mp4 → Video file
- .exe → Executable program

1.5 Introduction to ASCII and Unicode Standards

- **ASCII (American Standard Code for Information Interchange)**: A 7-bit or 8-bit coding system mainly used for English characters and symbols (codes 0–127).
- **Unicode**: A universal character encoding standard that supports almost all languages of the world (including Nepali, Devanagari script). Most widely used format: **UTF-8**

Answer Questions

1. Define a computer and list any four of its characteristics.

Answer: A computer is an electronic device that accepts raw data (input), processes it according to a set of instructions (program), produces meaningful information (output), and can store data for future use.

Four Characteristics of a Computer:

- **High Speed**: Computers can perform millions of calculations in a second.
- **Accuracy**: Computers give highly accurate results if the input and instructions are correct.
- **Storage Capacity**: They can store a large amount of data in a small space.
- **Diligence**: Computers can work continuously for long hours without getting tired or making mistakes due to fatigue.

2. Explain the five generations of computers with one major technology used in each generation.

Answer: The development of computers is divided into five generations based on the major technology used:

1. **First Generation (1940–1956)**: Major Technology – **Vacuum Tubes**. Computers were very large, expensive, and consumed high power. Example: ENIAC.
2. **Second Generation (1956–1963)**: Major Technology – **Transistors**. Computers became smaller, faster, and more reliable. Example: IBM 1401.
3. **Third Generation (1964–1971)**: Major Technology – **Integrated Circuits (IC)**. Computers became even smaller and more efficient. Example: IBM 360.
4. **Fourth Generation (1971–Present)**: Major Technology – **Microprocessor**. This led to the development of Personal Computers (PCs). Example: Intel processors.
5. **Fifth Generation (Present and Future)**: Major Technology – **Artificial Intelligence (AI) and Parallel Processing**. These computers support natural language processing and advanced decision-making.

3. Differentiate between Primary Memory and Secondary Memory with examples.
Answer:

Basis	Primary Memory	Secondary Memory
Definition	Memory directly accessible by the CPU	Memory used for permanent storage
Speed	Very fast	Slower than primary memory
Volatility	Mostly volatile (loses data when power off)	Non-volatile (data remains even after power off)
Capacity	Limited (small)	Very large capacity
Cost	Expensive per byte	Cheaper per byte
Examples	RAM, ROM, Cache Memory	Hard Disk (HDD), SSD, Pen Drive, CD/DVD

4. What is the difference between Hardware and Software? Give two examples of each.
Answer:
Hardware: All the physical parts of a computer system that can be seen and touched.
Software: A set of instructions and programs that tell the hardware what to do. Software cannot be touched.

Basis	Hardware	Software
Nature	Physical/Tangible	Non-physical/Intangible
Examples	Monitor, Keyboard, CPU, Hard Disk	Windows OS, MS Word, MS Excel, Google Chrome

Two Examples of Hardware: Keyboard, Monitor **Two Examples of Software**: Microsoft Windows, Microsoft Word
5. What is Multimedia? Mention any three elements of multimedia with their uses.
Answer: Multimedia is the combination of different media elements such as text, graphics, audio, video, and animation in a single digital presentation to make it more interactive and engaging.
Three Elements of Multimedia:

1. **Text**: Used to display written information, titles, and explanations (e.g., in e-governance notices).
2. **Audio**: Used for voice narration, background music, or sound effects (e.g., audio instructions in online learning).
3. **Video**: Used to show moving images with sound (e.g., training videos for government employees or awareness programs).

6. Differentiate between File and Folder.
Answer:

Basis	File	Folder (Directory)
Definition	A collection of related data stored as one unit	A container used to organize files and sub-folders
Purpose	Contains actual data or program	Used for better file management and organization
Size	Has a specific size	Does not have its own size (only contains files)
Example	report.docx, image.jpg, song.mp3	Documents, Downloads, Pictures

7. What is the difference between ASCII and Unicode?
Answer:

Basis	ASCII	Unicode
Full Form	American Standard Code for Information Interchange	Universal Code
Bit Size	7-bit or 8-bit	16-bit or more (supports UTF-8, UTF-16)
Characters Supported	Mainly English letters, numbers & symbols (128 or 256)	Almost all world languages including Nepali
Usage	Limited to English-based systems	Used in modern systems for multilingual support

8. Explain the functions of ALU and Control Unit in CPU.
Answer: ALU (Arithmetic Logic Unit): It performs all arithmetic operations (addition, subtraction, multiplication, division) and logical operations (AND, OR, NOT, comparison).
Control Unit (CU): It is the central nervous system of the CPU. Its main functions are:

- Fetching instructions from memory
- Decoding the instructions
- Directing other parts of the computer (ALU, memory, input/output) to execute the instructions
- Coordinating and controlling all operations inside the computer

9. Define Firmware. Give one example.
Answer: Firmware is a type of software that is permanently stored in the hardware (usually in ROM or flash memory). It provides low-level control for the device's specific hardware.
Example: **BIOS (Basic Input/Output System)** – It helps the computer start up and checks hardware during booting.
10. List any five common file extensions with their full forms and uses.
Answer:

File Extension	Full Form	Uses
.docx	Microsoft Word Document	Creating and editing text documents
.xlsx	Microsoft Excel Spreadsheet	Creating spreadsheets and calculations
.pptx	Microsoft PowerPoint Presentation	Making slide presentations
.pdf	Portable Document Format	Sharing read-only documents
.jpg / .jpeg	Joint Photographic Experts Group	Storing digital images

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1. Define a computer. List any four important characteristics of a computer.

Definition: A computer is an advanced electronic device that takes raw data as input from the user and processes it under the control of a set of instructions (called a program), produces a result (output), and saves it for future use.

Four Characteristics:

- **Speed:** Computers can perform millions of calculations in a fraction of a second (measured in MHz/GHz).
- **Accuracy:** Computers perform every calculation with the same accuracy, provided the input is correct (GIGO - Garbage In, Garbage Out).
- **Diligence:** Unlike humans, a computer is free from monotony, tiredness, and lack of concentration.
- **Versatility:** A computer is capable of performing almost any task, provided it can be reduced to a series of logical steps.

2. Explain the five generations of computers mentioning the major technology used.

The evolution of computers is categorized into five generations:

1. **First Generation (1946–1959):** Used **Vacuum Tubes**. (e.g., ENIAC, UNIVAC)
2. **Second Generation (1959–1965):** Used **Transistors**. (e.g., IBM 1401)
3. **Third Generation (1965–1971):** Used **Integrated Circuits (ICs)**. (e.g., IBM 360 series)
4. **Fourth Generation (1971–Present):** Uses **Microprocessors** (VLSI technology). (e.g., Pentiums, Core i-series)
5. **Fifth Generation (Future/Present):** Based on **Artificial Intelligence (AI)** and ULSI. (e.g., Robotics, Quantum computing)

3. Differentiate between Primary Memory and Secondary Memory with suitable examples.

Feature	**Primary Memory**	**Secondary Memory**
Nature	Volatile (temporary) memory.	Non-volatile (permanent) memory.
Speed	Faster access speed.	Slower access speed.
Capacity	Smaller storage capacity.	Much larger storage capacity.
Direct Access	Directly accessed by the CPU.	Not directly accessed by the CPU.
Examples	RAM, Cache.	Hard Disk (HDD), SSD, Pen drive.

4. What is the difference between Hardware and Software? Give two examples of each.

- **Hardware:** Refers to the physical, tangible components of a computer system that you can touch and feel.
  - Examples: Monitor, Keyboard, CPU, Motherboard.
- **Software:** Refers to a set of instructions or programs that tell the hardware what to do. It is intangible.
  - Examples: Windows 10/11, MS Word, Photoshop, Linux.

5. Define Multimedia. Mention any three elements of multimedia with their uses in education or e-governance.

Definition: Multimedia is the integration of multiple forms of media (text, graphics, audio, video, and animation) to communicate information digitally.

Three Elements & Uses:

1. **Text:** Used in e-governance portals to provide clear instructions and citizen charters.
2. **Video:** Used in education for video tutorials (e.g., YouTube lessons) to make learning more interactive.
3. **Animation:** Used in e-governance to demonstrate complex government processes (like how to apply for a license) through simple visual guides.

6. Differentiate between File and Folder with suitable examples.

Feature	**File**	**Folder**
Definition	A collection of data or information stored under a name.	A container used to organize and store files and other folders.
Extension	Always has a file extension (e.g., .docx, .jpg).	Does not have a file extension.
Size	Occupies specific disk space based on content.	Technically has no size of its own; its size is the sum of its contents.
Example	`report.pdf`, `image.png`	`Documents`, `Official_Letters`

7. What is the difference between ASCII and Unicode? Explain briefly.

- **ASCII (American Standard Code for Information Interchange):**
  - Uses **7 or 8 bits** to represent a character.
  - Can represent a maximum of **256 characters**.
  - Primarily supports the English language and basic symbols.
- **Unicode:**
  - Uses **8, 16, or 32 bits** (standard is often 16-bit).
  - Can represent over **1 million characters**.
  - Supports almost all written languages in the world, including **Nepali (Devanagari)**, which makes it essential for local governance in Nepal.

8. Explain the functions of Arithmetic Logic Unit (ALU) and Control Unit (CU) in CPU.

- **Arithmetic Logic Unit (ALU):** This unit performs all the actual data processing. It handles **arithmetic operations** (addition, subtraction, multiplication, division) and **logical operations** (comparisons like equal to, greater than, or less than).
- **Control Unit (CU):** This unit acts as the "manager" of the computer. It does not process data itself but directs the flow of data between the CPU, memory, and I/O devices by issuing control signals. It fetches, decodes, and executes instructions.

9. Define Firmware. Give one suitable example.

Definition: Firmware is a specific class of computer software that provides low-level control for a device's specific hardware. It is often described as "software for hardware" and is typically stored on a **ROM (Read-Only Memory)** chip so it isn't erased when power is lost.
Example: The **BIOS (Basic Input/Output System)** on a computer motherboard is the most common example of firmware.

10. List any five common file extensions with their full forms and primary uses.

Extension	**Full Form**	**Primary Use**
.docx	Word Open XML Document	Professional text documents (MS Word).
.xlsx	Excel Open XML Spreadsheet	Data calculation and analysis (MS Excel).
.pdf	Portable Document Format	Secure, non-editable document sharing.
.jpg	Joint Photographic Experts Group	Compressed image files for photos.
.exe	Executable File	Running or installing software programs.

11. What is Cache Memory? How does it differ from RAM?

Definition: Cache memory is a small, high-speed volatile memory located close to the CPU that stores frequently used instructions and data for rapid access.
Difference from RAM:

- **Speed:** Cache is significantly faster than RAM because it is built into or placed very near the CPU chip.
- **Cost:** Cache is much more expensive per megabyte than RAM.
- **Capacity:** Cache has a very small capacity (usually in MBs), whereas RAM is much larger (usually in GBs).
- **Placement:** Cache sits between the CPU and RAM to bridge the speed gap.

12. Explain the physical structure of a disk (Track, Sector, Cluster).

The surface of a magnetic disk is organized into:

- **Tracks:** Concentric circles drawn on the surface of the magnetic disk where data is stored.
- **Sectors:** Each track is further divided into smaller pie-shaped sections called sectors. A sector is the smallest physical storage unit on a disk (typically 512 bytes).
- **Cluster:** A group of one or more sectors. It is the smallest logical unit of disk space that the Operating System can allocate to hold a file.

13. What do you mean by Data and Information? Differentiate between them with examples.

- **Data:** Raw facts, figures, or symbols that have not been processed.
  - Example: "100", "Rabi", "Computer". (These have no clear meaning alone).
- **Information:** Processed data that is meaningful, organized, and useful to the user.
  - Example: "Rabi scored 100 marks in Computer." (This is a complete, meaningful message).

Feature	Data	Information
Form	Raw, unorganized material.	Processed, organized material.
Dependency	Does not depend on information.	Depends entirely on data.
Output	Acts as Input.	Acts as Output.

14. Define System Software and Application Software with two examples of each.

- **System Software:** A type of software designed to provide a platform for other software and manage the computer's hardware resources.
  - Examples: Operating Systems (Windows, Linux), Device Drivers.
- **Application Software:** A type of software designed to help the user perform specific tasks (like writing a letter or editing a photo).
  - Examples: MS Word, Google Chrome, Tally.

15. Write short notes on:

a) BIOS (Basic Input/Output System):
BIOS is a type of firmware stored on the ROM chip of the motherboard. Its primary function is to perform the **POST (Power-On Self-Test)** and initialize the computer's hardware components during the booting process before handing over control to the Operating System.

b) Unicode:
Unicode is a universal character encoding standard that assigns a unique number to every character, no matter the platform, program, or language. It is vital in the context of Nepal because it allows for the standardized digital use of **Devanagari script**, ensuring that Nepali text appears correctly across all devices and websites.