

## \_COS111Notes\_on

### \_Concept of the Computer System\_

A computer system is a combination of hardware and software components that work together to process, store, and communicate information.

Components of a Computer System:

- \_Hardware\_: physical components, such as central processing unit (CPU), memory, storage devices, input/output devices, and networking components
- \_Software\_: programs and operating systems that manage and utilize hardware resources
- \_Firmware\_: permanent software stored in non-volatile memory, controlling hardware components

Functions of a Computer System:

- \_Input\_: receiving data and instructions from users or other devices
- \_Processing\_: executing instructions and performing calculations using the CPU
- \_Storage\_: holding data and programs in memory or storage devices
- \_Output\_: presenting results to users or other devices
- \_Control\_: managing the flow of data and instructions between components

Types of Computer Systems:

- \_Personal Computer (PC)\_: designed for individual use, such as desktops, laptops, and mobile devices
- \_Mainframe Computer\_: large, powerful systems for business, scientific, and engineering applications
- \_Minicomputer\_: smaller, multi-user systems for business and scientific applications
- \_Embedded Computer\_: specialized systems integrated into devices, such as appliances, vehicles, and robots

Characteristics of a Computer System:

- \_Speed\_: processing speed and performance
- \_Capacity\_: storage capacity and memory size
- \_Accuracy\_: precision and reliability of calculations and operations
- \_Reliability\_: ability to operate continuously without failure
- \_Security\_: protection of data and systems from unauthorized access

Examples:

- A user wants to purchase a new computer. What factors should they consider when selecting a computer system?
- A business needs to upgrade its computer system. What types of computer systems are available, and what are their characteristics?

#### Tips for Understanding Computer Systems:

- Familiarize yourself with the components and functions of a computer system.
- Understand the different types of computer systems and their characteristics.
- Consider the needs and requirements of users when selecting or designing a computer system.

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#### \_Computer History\_

The history of computers spans over two centuries, from the early mechanical calculators to the modern digital computers.

#### \*Pre-Computer Era (1600s-1800s)\*

- \_Blaise Pascal's Pascaline (1642)\_ : a mechanical calculator for basic arithmetic operations
- \_Charles Babbage's Difference Engine (1822)\_ : a mechanical calculator for mathematical calculations
- \_Ada Lovelace's Notes on the Analytical Engine (1843)\_ : the first computer program, written for Babbage's Analytical Engine

#### \*Early Computer Era (1800s-1940s)\*

- \_Herman Hollerith's Tabulating Machine (1890)\_ : an electromechanical machine for data processing
- \_Konrad Zuse's Z1 (1936)\_ : the first fully automatic digital computer
- \_Colossus (1943)\_ : the first electronic computer, built for codebreaking during World War II

#### \*Modern Computer Era (1940s-1980s)\*

- \_ENIAC (1946)\_ : the first general-purpose electronic computer
- \_UNIVAC 1 (1951)\_ : the first commercially available computer
- \_Integrated Circuit (1958)\_ : the invention of the microchip, leading to smaller and faster computers
- \_Microprocessor (1971)\_ : the development of the first microprocessor, Intel 4004

#### \*Personal Computer Era (1970s-present)\*

- Apple I (1976): one of the first personal computers
- IBM PC (1981): a widely adopted personal computer, leading to the modern PC industry
- Internet and World Wide Web (1990s): the widespread adoption of the internet and web technologies

Examples:

- What were the key innovations of Charles Babbage's Analytical Engine?
- How did the development of the microprocessor impact the computer industry?

Tips for Understanding Computer History:

- Familiarize yourself with the key milestones and innovations in computer history.
- Understand the contributions of pioneers like Babbage, Lovelace, and Zuse.
- Recognize the impact of technological advancements on the development of modern computers.

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Generations of Computers

The development of computers can be divided into five distinct generations, each characterized by significant technological advancements and improvements.

First Generation (1940s-1950s):

- Vacuum Tubes: used as the primary electronic components
- Machine Language: the only programming language available
- Punch Cards and Magnetic Drums: used for input/output and storage
- Examples: ENIAC, UNIVAC 1

Second Generation (1950s-1960s):

- Transistors: replaced vacuum tubes, increasing speed and reliability
- Assembly Language: introduced as a programming language
- Magnetic Tapes and Disks: used for storage
- Examples: IBM 7090, TRADIC

Third Generation (1960s-1970s):

- Integrated Circuits: replaced transistors, further increasing speed and reliability
- High-Level Languages: introduced, such as COBOL and FORTRAN
- Operating Systems: developed to manage computer resources

- Examples: IBM System/360, PDP-8

Fourth Generation (1970s-1980s):

- Microprocessors: introduced, enabling the development of personal computers
- Semiconductor Memory: replaced magnetic tapes and disks
- Graphical User Interfaces: introduced, making computers more user-friendly
- Examples: Apple II, IBM PC

Fifth Generation (1980s-present):

- Artificial Intelligence and Expert Systems: integrated into computers
- Parallel Processing and Distributed Computing: enabled faster processing and increased scalability
- Internet and World Wide Web: revolutionized communication and information sharing
- Examples: Modern PCs, laptops, and mobile devices

Examples:

- What were the key technological advancements of the second generation of computers?
- How did the introduction of microprocessors impact the development of personal computers?

Tips for Understanding Computer Generations:

- Familiarize yourself with the key technological advancements of each generation.
- Understand the impact of each generation on the development of modern computers.
- Recognize the contributions of pioneers and innovators in the development of computer technology.

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Number Systems

A number system is a way of representing numbers using a specific set of digits and rules.

Types of Number Systems:

- Decimal Number System (Base 10): uses 10 digits (0-9) to represent numbers
- Binary Number System (Base 2): uses 2 digits (0-1) to represent numbers, commonly used in computer systems
- Octal Number System (Base 8): uses 8 digits (0-7) to represent numbers
- Hexadecimal Number System (Base 16): uses 16 digits (0-9, A-F) to represent numbers, commonly used in computer programming

### Number System Conversions:

- Decimal to Binary: converting decimal numbers to binary numbers
- Binary to Decimal: converting binary numbers to decimal numbers
- Decimal to Octal: converting decimal numbers to octal numbers
- Octal to Decimal: converting octal numbers to decimal numbers
- Decimal to Hexadecimal: converting decimal numbers to hexadecimal numbers
- Hexadecimal to Decimal: converting hexadecimal numbers to decimal numbers

### Number System Operations:

- Addition: adding numbers in a specific number system
- Subtraction: subtracting numbers in a specific number system
- Multiplication: multiplying numbers in a specific number system
- Division: dividing numbers in a specific number system

### Importance of Number Systems:

- Computer Programming: number systems are used to write code and represent data in computer programs
- Data Representation: number systems are used to represent data in computers, such as images, audio, and text
- Cryptography: number systems are used to develop secure encryption algorithms

### Examples:

- Convert the decimal number 25 to binary.
- Convert the hexadecimal number A2 to decimal.
- Perform binary addition:  $1010 + 1100$ .

### Tips for Understanding Number Systems:

- Familiarize yourself with the different types of number systems.
- Practice converting between number systems.
- Understand the importance of number systems in computer programming and data representation.

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### Computer Programming Languages

A computer programming language is a set of instructions and rules used to write software, apps, and websites. Programming languages are used to communicate with computers and create a wide range of digital products.

### Types of Programming Languages:

- Low-Level Languages: close to machine language, used for operating systems and embedded systems, e.g., Assembly Language
- High-Level Languages: farther from machine language, used for applications and web development, e.g., C++, Java, Python
- Scripting Languages: used for rapid development and execution, e.g., JavaScript, PHP, Ruby
- Markup Languages: used for structuring and formatting data, e.g., HTML, XML

### Programming Language Characteristics:

- Syntax: rules governing the structure of code
- Semantics: meaning of code and how it is executed
- Data Types: types of data that can be used in a program
- Control Structures: statements that control the flow of a program

### Popular Programming Languages:

- C++: high-performance language for operating systems, games, and applications
- Java: object-oriented language for Android apps, web development, and enterprise software
- Python: versatile language for data science, machine learning, web development, and automation
- JavaScript: scripting language for web development, game development, and mobile app development

### Examples:

- What are the advantages and disadvantages of using a high-level programming language like Python?
- How does a programmer choose the most suitable programming language for a specific project?

### Tips for Learning Programming Languages:

- Start with the basics: understand the syntax, semantics, and data types of a language
- Practice coding: write programs to reinforce learning and build skills
- Join online communities: participate in forums, discussions, and coding challenges to stay motivated and learn from others.

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Internet/Networking

The internet is a global network of interconnected computers and servers that communicate with each other using standardized protocols. Networking refers to the process of connecting devices to share resources, exchange data, and communicate.

#### Internet Basics:

- Internet Protocol (IP): a unique address assigned to each device on a network
- Domain Name System (DNS): translates domain names into IP addresses
- Hypertext Transfer Protocol (HTTP): a protocol for transferring data over the internet
- World Wide Web (WWW): a system of interlinked hypertext documents accessed via the internet

#### Networking Fundamentals:

- Local Area Network (LAN): a network of devices connected within a limited geographical area
- Wide Area Network (WAN): a network of devices connected over a larger geographical area
- Metropolitan Area Network (MAN): a network of devices connected within a metropolitan area
- Wireless Network (WLAN): a network of devices connected wirelessly

#### Networking Devices:

- Router: connects multiple networks and routes data between them
- Switch: connects devices within a network and forwards data packets
- Modem: connects a network to the internet via a broadband connection
- Network Interface Card (NIC): a hardware component that connects a device to a network

#### Internet Services:

- Email: a service for sending and receiving electronic messages
- File Transfer Protocol (FTP): a service for transferring files over the internet
- Remote Access: a service that allows users to access a network or device remotely
- Online Storage: a service that allows users to store and access files online

#### Examples:

- What is the difference between a LAN and a WAN?
- How does a router connect multiple networks and route data between them?

#### Tips for Understanding Internet/Networking:

- Familiarize yourself with internet basics, such as IP addresses, DNS, and HTTP.

- Understand the different types of networks, including LAN, WAN, and WLAN.
- Learn about networking devices, such as routers, switches, and modems.
- Explore internet services, such as email, FTP, and online storage.

## COS111 Notes\_

### \_Computer Viruses\_

A computer virus is a type of malicious software (malware) that replicates itself by attaching to other programs or files on a computer. Viruses can cause a range of problems, from slowing down system performance to deleting or corrupting data.

#### Types of Computer Viruses:

- Trojan Horse: disguises itself as a legitimate program, but actually contains malicious code
- Worms: self-replicating viruses that spread from system to system without user interaction
- Rootkits: hide malware or viruses from the operating system, making them difficult to detect
- Logic Bombs: viruses that remain dormant until triggered by a specific event or action
- Ransomware: viruses that encrypt files and demand payment in exchange for the decryption key

#### How Viruses Spread:

- Email Attachments: viruses can be spread through email attachments or links
- Infected Software: viruses can be embedded in software downloads or installations
- Infected Websites: viruses can be spread through visiting infected websites or clicking on malicious links
- USB Drives: viruses can be spread through infected USB drives or other external devices

#### Symptoms of a Virus Infection:

- Slow System Performance: viruses can consume system resources, slowing down performance
- Crashing or Freezing: viruses can cause system crashes or freezing
- Pop-Ups or Ads: viruses can display unwanted pop-ups or ads
- Data Loss or Corruption: viruses can delete or corrupt files and data

#### Prevention and Removal:

- Install Antivirus Software: use reputable antivirus software to detect and remove viruses
- Keep Software Up-to-Date: regularly update operating systems, software, and plugins to patch security vulnerabilities
- Avoid Suspicious Emails and Links: be cautious when opening email attachments or clicking on links from unknown sources



- Use Strong Passwords: use strong, unique passwords to prevent unauthorized access to systems and data

Examples:

- What are the differences between a Trojan horse and a worm?
- How can you protect your computer from ransomware attacks?

Tips for Preventing Virus Infections:

- Be cautious when downloading software or files from the internet.
- Keep your operating system, software, and plugins up-to-date.
- Use strong antivirus software and regularly scan your system for viruses.
- Avoid using public computers or public Wi-Fi for sensitive activities.

: COS111 Course Outline

Concept of Computer system

Computer history

Generations of Computer

Number System

Computer programming language

Internet/networking

Computer virus

## QUIZZ SECTION

Question 1

What is the primary function of the Central Processing Unit (CPU) in a computer system?

- A) To store data
- B) To perform calculations and execute instructions
- C) To provide input/output operations
- D) To manage memory

Answer: B

Question 2

Which of the following is considered the first generation of computers?

- A) Transistors
- B) Integrated Circuits
- C) Vacuum Tubes
- D) Microprocessors

Answer: C

Question 3

What is the binary number system based on?

- A) Base 8
- B) Base 10
- C) Base 2
- D) Base 16

Answer: C

Question 4

Which programming language is known for its simplicity and is often taught to beginners?

- A) Java
- B) Python
- C) C++
- D) BASIC

Answer: D

Question 5

What is the primary function of the Internet Protocol (IP) in networking?

- A) To provide security
- B) To manage data transmission
- C) To assign IP addresses
- D) To provide error correction

Answer: C

Question 6

What type of computer virus is designed to replicate itself and spread to other computers?

- A) Trojan
- B) Worm
- C) Spyware
- D) Adware

Answer: B

Question 7

What is the term for a group of computers connected together to share resources?

- A) Internet
- B) Intranet
- C) Network
- D) Database

Answer: C

Question 8

Which of the following is a characteristic of a first-generation computer?

- A) Used integrated circuits
- B) Used vacuum tubes
- C) Used transistors
- D) Used microprocessors

Answer: B

Question 9

What is the term for a program that is designed to damage or disrupt a computer system?

- A) Virus
- B) Worm
- C) Trojan
- D) Malware

Answer: D

Question 10

Which of the following programming languages is known for its platform independence?

- A) Java
- B) Python
- C) C++
- D) BASIC

Answer: A