**CHAPTER 1**

**Check points answers**

**Check points 1**

* 1. **What is a program?**

A computer program is a collection of instructions[1] that can be executed by a computer to perform a specific task.

* 1. **What is hardware?**

The term hardware refers to all of the physical devices, or components, that a computer is made of. A computer is not one single device, but a system of devices that all work together. Like the different instruments in a symphony orchestra, each device in a computer plays its own part.

* 1. **List the five major components of a computer system.**

• The central processing unit (CPU)

• Main memory

• Secondary storage devices

• Input devices

• Output devices

* 1. **What part of the computer actually runs programs?**

The central processing unit, or CPU, is the part of a computer that actually runs programs.

* 1. **What part of the computer serves as a work area to store a program and its data while the program is running?**

You can think of main memory as the computer’s work area. This is where the computer stores a program while the program is running, as well as the data that the program is working with.

* 1. **What part of the computer holds data for long periods of time, even when** there is no power to the computer?

Secondary storage is a type of memory that can hold data for long periods, even when there is no power to the computer. Programs are normally stored in secondary memory and loaded into main memory as needed. Important data, such as word processing documents, payroll data, and inventory records, is saved to secondary storage as well.

* 1. **What part of the computer collects data from people and from other devices?**

Input is any data the computer collects from people and from other devices. The component that collects the data and sends it to the computer is called an input device. Common input devices are the keyboard, mouse, scanner, microphone, and digital camera. Disk drives and optical drives can also be considered input devices because programs and data are retrieved from them and loaded into the computer’s memory.

* 1. **What part of the computer formats and presents data for people or other devices?**

Output is any data the computer produces for people or for other devices. It might be a sales report, a list of names, or a graphic image. The data is sent to an output device, which formats and presents it. Common output devices are video displays and printers.

**1.9 What fundamental set of programs control the internal operations of the**

**Computer’s hardware?**

Operating Systems

**1.1oWhat do you call a program that performs a specialized task, such as a virus scanner, a file compression program, or a data backup program?**

Utility Programs

**1.11 Word processing programs, spreadsheet programs, email programs, web browsers, and game programs belong to what category of software?**

Application Software.

**Check points 2**

**1.12 What amount of memory is enough to store a letter of the alphabet or a small**

**number?**

One byte is only enough memory to store a letter of the alphabet or a small number.

**1.13 What do you call a tiny “switch” that can be set to either on or off?**

Computer scientists usually think of bits as tiny switches that can be either on or off. The term bit stands for binary digit.

**1.14 In what numbering system are all numeric values written as sequences of 0s and 1s?**

This corresponds perfectly to the binary numbering system. In the binary numbering system (or binary, as it is usually called), all numeric values are written as sequences of 0s and 1s.

**1.15 What is the purpose of ASCII?**

ASCII is used to convert text into binary numbers to store in the computer in digital form. ASCII is a set of 128 numeric codes that represent the English letters, various punctuation marks, and other characters.

**1.16 What encoding scheme is extensive enough to represent the characters of many of the languages in the world?**

Unicode is an extensive encoding scheme that is compatible with ASCII, but can also represent characters for many of the languages in the world. Today, Unicode is quickly becoming the standard character set used in the computer industry

**1.17 What do the terms “digital data” and “digital device” mean?**

* Data that is stored in binary format is called as digital data.
* Any device that works with binary data is called as digital device.

Checkpoint3

**1.18 A CPU understands instructions that are written only in what language?**

A computer’s CPU can only understand instructions that are written in machine language.

**1.19 A program has to be copied into what type of memory each time the CPU**

**executes it?**

A program has to be copied into main memory, or RAM, each time the CPU executes it

**1.20 When a CPU executes the instructions in a program, it is engaged in what process?**

When a CPU executes the instructions in a program, it is engaged in a process that is known as the fetch-decode-execute cycle. This cycle, which consists of three steps, is repeated for each instruction in the program.

**1.21 What is assembly language?**

Assembly language was created in the early days of computing as an alternative to machine language. Instead of using binary numbers for instructions, assembly language uses short words that are known as mnemonics. For example, in assembly language, the mnemonic add typically means to add numbers.

**1.22 What type of programming language allows you to create powerful and complex programs without knowing how the CPU works?**

A high-level language allows you to create powerful and complex programs without knowing how the CPU works.

**1.23 Each language has a set of rules that must be strictly followed when writing a program. What is this set of rules called?**

Syntax is a set of rules that must be strictly followed when writing a program. The syntax rules dictate how key words, operators, and various punctuation characters must be used in a program.

**1.24 What do you call a program that translates a high-level language program into a separate machine language program?**

A compiler is a program that translates a high-level language program into a separate machine language program.

1.25 What do you call a program that both translates and executes the instructions in a high-level language program?

Interpreter is a program that both translates and executes the instructions in a high-level language program. As the interpreter reads each individual instruction in the program, it converts it to machine language instructions then immediately executes them.

1.26 What type of mistake is usually caused by a misspelled key word, a missing

Punctuation character or the incorrect use of an operator?

A syntax error is a mistake such as a misspelled key word, a missing punctuation character, or the incorrect use of an operator. When this happens, the compiler or interpreter displays an error message indicating that the program contains a syntax error.

Review Questions

Multiple Choice

1. A(n) \_\_\_\_\_\_\_\_\_\_ is a set of instructions that a computer follows to perform a task.

a. compiler

b. program

c. interpreter

d. programming language

2. When the computer is turned off, the contents of main memory are erased because it is \_\_\_\_\_\_\_\_\_\_.

a. static

b. dynamic

c. volatile

d. inaccessible

3. The part of a computer that runs programs is called \_\_\_\_\_\_\_\_\_\_.

a. RAM

b. secondary storage

c. main memory

d. the CPU

4. The program that controls and manages the basic operations of a computer is generally

referred to as \_\_\_\_\_\_\_\_\_\_.

a. instruction set

b. system software

c. utility program

d. application software

5. The computer stores a program while the program is running, as well as the data that the program is working with, in \_\_\_\_\_\_\_\_\_\_.

a. secondary storage

b. the CPU

c. main memory

d. the microprocessor

6. This is a volatile type of memory that is used only for temporary storage while a program is running.

a. RAM

b. secondary storage

c. the disk drive

d. the USB drive

7. A type of memory that can hold data for long periods of time, even when there is no power to the computer, is called \_\_\_\_\_\_\_\_\_\_.

a. RAM

b. main memory

c. secondary storage

d. CPU storage

8. A component that collects data from people or other devices and sends it to the com-

puter is called \_\_\_\_\_\_\_\_\_\_.

a. an output device

b. an input device

c. a secondary storage device

d. main memory

9. A program can be run by using the \_\_\_\_\_\_\_\_\_\_ cycle.

a. fetch-execute-decode

b. fetch-decode-execute

c. decode-fetch-execute

d. fetch-encode-decode-execute

10. A \_\_\_\_\_\_\_\_\_\_ is enough memory to store a letter of the alphabet or a small number.

a. byte

b. bit

c. switch

d. transistor

11. A byte is made up of eight \_\_\_\_\_\_\_\_\_\_.

a. CPUs

b. instructions

c. variables

d. bits

12. In the \_\_\_\_\_\_\_\_\_\_ numbering system, all numeric values are written as sequences of 0s and 1s.

a. hexadecimal

b. binary

c. octal

d. decimal

13. A bit that is turned off represents the following value: \_\_\_\_\_\_\_\_\_\_.

a. 1

b. –1

c. 0

d. “no”

14. A set of 128 numeric codes that represent the English letters, various punctuation marks, and other characters is \_\_\_\_\_\_\_\_\_\_.

a. binary numbering

b. ASCII

c. Unicode

d. ENIAC

15. An extensive encoding scheme that can represent characters for many languages in the

world is \_\_\_\_\_\_\_\_\_\_.

a. binary numbering

b. ASCII

c. Unicode

d. ENIAC

16. Negative numbers are encoded using the \_\_\_\_\_\_\_\_\_\_ technique.

a. two’s complement

b. floating point

c. ASCII

d. Unicode

17. IDLE stands for

a. Interactive Development Environment

b. Integrated Development Environment

c. Interprocess Development Environment

d. Interface Development Environment

18. The tiny dots of color that digital images are composed of are called \_\_\_\_\_\_\_\_\_\_.

a. bits

b. bytes

c. color packets

d. pixels

19. The Python interpreter is commonly called the \_\_\_\_\_\_\_\_\_\_ when it is running in

interactive mode.

a. Command prompt

b. Python shell

c. IDLE

d. Interpreter terminal

20. In the \_\_\_\_\_\_\_\_\_\_ part of the fetch-decode-execute cycle, the CPU determines which operation it should perform.

a. fetch

b. decode

c. execute

d. immediately after the instruction is executed.

21. Computers can only execute programs that are written in \_\_\_\_\_\_\_\_\_\_.

a. Java

b. assembly language

c. machine language

d. Python

22. The \_\_\_\_\_\_\_\_\_\_ translates an assembly language program to a machine language program.

a. assembler

b. compiler

c. translator

d. interpreter

23. The words that make up a high-level programming language are called \_\_\_\_\_\_\_\_\_\_.

a. binary instructions

b. mnemonics

c. commands

d. key words

24. The rules that must be followed when writing a program are called \_\_\_\_\_\_\_\_\_\_.

a. syntax

b. punctuation

c. key words

d. operators

25. A(n) \_\_\_\_\_\_\_\_\_\_ program translates a high-level language program into a separate

machine language program.

a. assembler

b. compiler

c. translator

d. utility

***True or False***

1. Today, CPUs are huge devices made of electrical and mechanical components such asvacuum tubes and switches.(f)

2. Main memory is also known as RAM.(t)

3. RAM is used to store data permanently.(t)

4. Images, like the ones you make with your digital camera, cannot be stored as binary numbers.(f)

5. Machine language is the only language that a CPU understands.(t)

6. In a computer system, bits are tiny electrical components that can hold either a positive or a negative charge.(f)

7. An interpreter is a program that both translates and executes the instructions in a high-level language program.(t)

8. An assembler is a special program that is used to convert mnemonics to its equivalent machine code.(f)

9. def and import are operators in Python.(f)

10. Word processing programs, spreadsheet programs, email programs, web browsers, and games are all examples of utility programs.(f)

***Short Answer***

1. **Why is the CPU the most important component in a computer?**

The processor acts as the computer's brain, running programs and sending and receiving signals to attached devices to keep the computer running.

1. **What number does a bit that is turned on represent? What number does a bit that is turned off represent?**

In computer systems, a **bit that is turned on represents** the **number** 1. A **bit that is turned off represents** the **number** 0. This relates to the binary numbering system. In the binary numbering system or binary system, all numeric values are written as sequences of 0s and 1s

1. **How does a computer system store negative and real numbers in memory?**

Suppose the following fragment of code, int a = -34; Now how will this be stored in memory. So here is the complete theory. Whenever a number with minus sign is encountered, the number (ignoring minus sign) is converted to its binary equivalent. Then the two’s complement of the number is calculated. That two’s complement is kept at place allocated in memory and the sign bit will be set to 1 because the binary being kept is of a negative number. Whenever it comes on accessing that value firstly the sign bit will be checked if the sign bit is 1 then the binary will be two’s complemented and converted to equivalent decimal number and will be represented with a minus sign.

Let us take an example:

Example –

int a = -2056;

Binary of 2056 will be calculated which is:

00000000000000000000100000001000 (32 bit representation, according of storage of int in C)

2’s complement of the above binary is:

11111111111111111111011111111000.

So finally the above binary will be stored at memory allocated for variable a.

When it comes on accessing the value of variable a, the above binary will be retrieved from the memory location, then its sign bit that is the left most bit will be checked as it is 1 so the binary number is of a negative number so it will be 2’s complemented and when it will be 2’s complemented will be get the binary of 2056 which is:

00000000000000000000100000001000

The above binary number will be converted to its decimal equivalent which is 2056 and as the sign bit was 1 so the decimal number which is being gained from the binary number will be represented with a minus sign. In our case -2056.

1. **Determine the value of 11001011.**
2. step by step solution
3. **Step 1**: Write down the binary number:
4. 11001011
5. **Step 2**: Multiply each digit of the binary number by the corresponding power of two:
6. 1x27 + 1x26 + 0x25 + 0x24 + 1x23 + 0x22 + 1x21 + 1x20
7. **Step 3:** Solve the powers:
8. 1x128 + 1x64 + 0x32 + 0x16 + 1x8 + 0x4 + 1x2 + 1x1 = 128 + 64 + 0 + 0 + 8 + 0 + 2 + 1
9. **Step 4**: Add up the numbers written above:
10. 128 + 64 + 0 + 0 + 8 + 0 + 2 + 1 = 203.
11. So, 203 is the decimal equivalent of the binary number 11001011.

**5. What are the basic operations that the CPU is designed to perform?**

**The CPU processes instructions it receives in the process of decoding data. In processing this data, the CPU performs four basic steps:**

* Fetch: Each instruction is stored in memory and has its own address. The processor takes this address number from the program counter, which is responsible for tracking which instructions the CPU should execute next.
* Decode: All programs to be executed are translated into Assembly instructions. Assembly code must be decoded into binary instructions, which are understandable to your CPU. This step is called decoding.
* Execute: While executing instructions, the CPU can do one of three things: Do calculations with its ALU, move data from one memory location to another, or jump to a different address.
* Store: The CPU must give feedback after executing an instruction, and the output data is written to the memory.

**6. What is a translator program? Describe its various kinds.**

**7. What type of software controls the internal operations of the computer’s hardware?**