

Review Questions:

Basic Principles of

Design and Construction

of Digital Computers

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1. List the major components of a generic computer system, and briefly describe the function of each.
2. What electronic device was used as a switch in the earliest electronic computers?
3. What is the derivation of the word *transistor*?
4. What are the principal types of transistors?
5. What are the major categories of circuit packages?
6. What are the major constituents of a typical Personal Computer or Workstation?
7. What is the function of the Clock Generator?
8. What is meant by the term “active-low”?
9. Define the term “bus”. What are the four major constituents of a bus? Briefly describe the function of each, and indicate which ones in the “Bebputer” are unidirectional and which are bidirectional.
10. Name several different kinds of data that can be represented in memory locations in a digital computer.

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11. What is the difference in the electrical connections between ROM and RAM?
12. Explain how various memory modules (both RAM and ROM) can be organized and connected to construct the totality of a computer's semiconductor primary memory.
13. Explain the memory map of the "Beboputer" **and** of the IBM PC.
14. Explain how circuit components can be connected and configured to constitute an Input Port or an Output Port of specified address.
15. Draw a diagram and explain how a single bit of Magnetic Core memory works.
16. Why is it that some instructions occupy only one byte of memory, while others occupy two or three or more bytes?
17. Define each of the following terms:
 - a. Hardware
 - b. Software
 - c. Firmware
 - d. Wetware
 - e. Vaporware
 - f. Freeware
 - g. Shareware

Answers to Selected Questions:

1. List the major components of a generic computer system, and briefly describe the function of each.

Answer: See *Bebop Bytes Back*, Figure 1.1

Inputs
Processor
Outputs
Memory

2. What electronic device was used as a switch in the earliest electronic computers?

Answer: the Vacuum Tube (triode or pentode)

3. What is the derivation of the word *transistor*?

Answer: transfer resistor

4. What are the principal types of transistors?

Answer:

point-contact transistors
Bipolar Junction Transistors (BJTs)
Field-Effect Transistors

5. What are the major categories of circuit packages?

Answer:

Discrete Components
Printed Circuit Boards (PCBs)
Integrated Circuits (ICs)
 Small-Scale Integration (SSI)
 Medium-Scale Integration (MSI)
 Large-Scale Integration (LSI)
 Very Large-Scale Integration (VLSI)

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6. What are the major constituents of a typical Personal Computer or Workstation?

Answer:

- Processor
- (Main or Primary) Semiconductor Memory
- Secondary Store: Hard Disk
- Removable Store:
 - Floppy Disk
 - CD-ROM
- Monitor
- Keyboard
- Mouse
- Printer
- Network Card and/or Modem Card
- Other (optional) devices and accessories:
 - Sound card
 - Scanner
 - Surge Suppressor
 - Power Conditioner
 - “Uninterruptible” Power Supply

7. What is the function of the Clock Generator?

Answer: See page 2-4 in *Bebop Bytes Back*.

8. What is meant by the term “active-low”?

Answer: See text and sidebar on page 2-5 in *Bebop Bytes Back*.

9. Define the term “bus”. What are the four major constituents of a bus? Briefly describe the function of each, and indicate which ones in the “Beboputer” are unidirectional and which are bidirectional.

Answer: Data Bus; Address Bus; Control Bus; and Power Bus. Further explanation is to be found in *Bebop Bytes Back*, pages 2-6 through 2-9.

10. Name several different kinds of data that can be represented in memory locations in a digital computer.

Answer:

Instructions

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Numbers of different types, of which the simplest type is Non-Negative Integers
Text characters (ASCII, extended ASCII, and EBCDIC)
Bit patterns

11. What is the difference in the electrical connections between ROM and RAM?

Answer: See Figure 2.20 and accompanying text in *Bebop Bytes Back*.

12. Explain how various memory modules (both RAM and ROM) can be organized and connected to construct the totality of a computer's semiconductor primary memory.

Answer: See **both** Figures 2.21 and 2.22, and also the accompanying text, in *Bebop Bytes Back*.

13. Explain the memory map of the "Beboputer" **and** of the IBM PC.

Answer: For the "Beboputer", see Figure 2.23 and the accompanying text in *Bebop Bytes Back*. For the IBM PC, either search the internet or find a reference in your local library. Be sure that you understand and can describe and give memory address ranges for each of the following memory areas:

Conventional Memory Area

Upper Memory Area

Video RAM area

Video adapter card BIOS area

BIOS areas for other adapter cards

System BIOS area

High Memory Area (NOTE: Understanding how this area came into existence, and both the what and the why of its precise dimensions, is an excellent opportunity to put to use your newly-found expertise in understanding binary and hexadecimal numbers.)

Extended Memory Area

14. Explain how circuit components can be connected and configured to constitute an Input Port or an Output Port of specified address.

Answer: See Figures 2.24 and 2.25 **and accompanying text** in *Bebop Bytes Back*.

15. Draw a diagram and explain how a single bit of Magnetic Core memory works.

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Answer: See Figure 3.2 and accompanying text in *Bebop Bytes Back*. Note the importance of the row wires, the column wires, and the sense wire, as explained in the text and illustrated in the right-hand component of Figure 3.2.

16. Why is it that some instructions occupy only one byte of memory, while others occupy two or three or more bytes?

Answer: See the bottom paragraph on page 3-18, and all of page 3-19, in *Bebop Bytes Back*.

17. Define each of the following terms:

- h. Hardware
- i. Software
- j. Firmware
- k. Wetware
- l. Vaporware
- m. Freeware
- n. Shareware

Answer: See page 3-31 in *Bebop Bytes Back*.