

## Review questions for Chapter 5 **Computer Components**

1. True or False? For tasks like Web surfing, sufficient memory can make up for a slow processor.
2. True or False? A megabyte of memory space is larger than a gigabyte of memory space.
3. True or False? The prefix kilo means 1000 when referring to speed and 1024 when referring to storage.
4. True or False? The von Neumann architecture is characterized by the fact that instructions and data are logically the same and can both be stored in memory.
5. True or False? In a von Neumann architecture, the devices that store information and the devices that process information are the same.
6. True or False? Addressability is the number of bits stored in each addressable location in memory.
7. True or False? The control unit and the arithmetic/logic unit are both part of the central processing unit (CPU).
8. True or False? The bit pattern stored at a particular memory location conveys what kind of information it represents (a number, part of an image, etc.).
9. True or False? A register is a small storage area in the CPU.
10. True or False? The program counter is a register that stores the number of instructions executed by a computer.
11. True or False? The control unit manages the fetch-execute cycle.
12. True or False? The bus is a group of wires through which data travels within a computer.
13. True or False? The fetch part of the fetch-execute cycle fetches the next instruction to be executed from memory.
14. True or False? The CPU determines what additional data may be needed to execute an instruction.
15. True or False? A volatile storage device loses its memory if its power supply is turned off.
16. True or False? RAM is non-volatile and ROM is volatile.
17. True or False? Both RAM and ROM are random-access devices.
18. True or False? A disk drive may be composed of multiple disks.
19. True or False? The read/write heads of a disk drive all read from the same disk at the same time.
20. True or False? The seek time of a disk drive is the time it takes for the specified sector to rotate under the read/write head.

21. True or False? A compact disc stores data using magnetized particles.
22. True or False? The data on a CD-RW can be rewritten multiple times.
23. True or False? A touch screen is both an input and output device.
24. True or False? Some touch screen will not work if the user has a glove on.
25. True or False? Pipelining is a technique that uses several different processors, where each contributes one part to an overall computation.
26. . Which of the following is a popular central processing unit?
- A. Hertz
  - B. Pentium 4
  - C. random access
  - D. cycles per second
  - E. modem
27. Which of the following means that each memory location can be accessed by its address?
- A. Hertz
  - B. Pentium 4
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28. Which of the following is a unit of frequency?
- A. Hertz
  - B. Pentium 4
  - C. random access
  - D. cycles per second
  - E. modem
29. Which of the following is a device that allows a computer to connect to the Internet?
- A. Hertz
  - B. Pentium 4
  - C. random access
  - D. cycles per second
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30. The prefix *nano* refers to which power of ten?
- A.  $10^{-12}$
  - B.  $10^{-9}$
  - C.  $10^{-6}$
  - D.  $10^{-3}$
31. The prefix *micro* refers to which power of ten?
- A.  $10^{-12}$
  - B.  $10^{-9}$

- C.  $10^{-6}$
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32. The prefix *mega* refers to which power of two?
- A.  $2^{10}$
  - B.  $2^{20}$
  - C.  $2^{30}$
  - D.  $2^{40}$
  - E.  $2^{50}$

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- A.  $2^{10}$
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  - D.  $2^{40}$
  - E.  $2^{50}$

34. A von Neumann computer architecture is best characterized by which of the following?
- A. program input device
  - B. read only memory
  - C. random access memory
  - D. stored-program concept
  - E. the use of disk drives

35. Addressability refers to which of the following?
- A. the number of bits stored in each addressable location
  - B. the size of each addressable location
  - C. the size of a memory address
  - D. the capacity of a memory device
  - E. the number of bytes currently holding data in a memory device

36. Which of the following contains the instruction register?
- A. control unit
  - B. arithmetic/logic unit
  - C. auxiliary storage device
  - D. RAM
  - E. ROM

37. Which of the following contains the program counter?
- A. control unit
  - B. arithmetic/logic unit
  - C. auxiliary storage device
  - D. RAM
  - E. ROM

38. Which of the following is volatile?
- A. control unit
  - B. arithmetic/logic unit

- C. auxiliary storage device
- D. RAM
- E. ROM

39. Which of the following manages the fetch-execute cycle?

- A. control unit
- B. arithmetic/logic unit
- C. auxiliary storage device
- D. RAM
- E. ROM

40. Which of the following executes an instruction once it is decoded?

- A. control unit
- B. arithmetic/logic unit
- C. auxiliary storage device
- D. RAM
- E. ROM

41. Which of the following best describes a register?

- A. a memory location which stores a sum
- B. a device that contains the arithmetic/logic unit
- C. a device that contains the control unit
- D. a large memory location in auxiliary storage
- E. a small memory location in the central processing unit

42. The instruction register is used to store which of the following?

- A. an instruction
- B. the memory location of an instruction
- C. the number of program instructions executed
- D. the number of programs executed
- E. the data used by an instruction

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- B. the memory location of an instruction
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44. Which of the following is referred to as the computer's bus?

- A. the device used to transfer data from auxiliary storage
- B. the storage location for the currently executing program
- C. the set of wires through which data travels among the core devices
- D. the storage location for the current instruction
- E. the number of bytes transferred from RAM to ROM

45. Which of the following is the time it takes for the read/write head of a disk drive to get into position over a specified track?

- A. seek time

- B. latency
- C. transfer rate
- D. spindle time
- E. access time

46. Which of the following is the time it takes for the specified sector to rotate to the read/write head of a disk drive?

- A. seek time
- B. latency
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- D. spindle time
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47. Which touch screen technology uses a laminate that conducts electricity and causes current to flow to a finger or stylus when touched?

- A. resistive touch screen
- B. capacitive touch screen
- C. infrared touch screen
- D. addressable touch screen
- E. surface acoustic wave touch screen

48. Which parallel-processing approach applies the same program to multiple data sets using multiple processors?

- A. synchronous processing
- B. tandem processing
- C. pipelining processing
- D. transfer processing
- E. decode processing

49. What does the term *Core™ Duo* refer to in the description of the components of the **Instavilion 640 Laptop**?

- A. the presence of two central core processors in the laptop computer
- B. the presence of two central core lithium batteries in the laptop computer
- C. the presence of two central hard drives in the laptop computer
- D. the presence of two front side buses (FSBs) in the laptop computer
- E. the presence of two software operating systems in the laptop computer

50. What is the function of the front side bus (FSB) in a computer?

- A. The FSB activates access to the megabytes of memory stored in the computer's cache.
- B. The FSB determines the resolution standard for the display screen of the computer.
- C. The FSB holds the capacity of memory contained in the graphics processor unit (GPU) of the computer
- D. The FSB protects the integrity and security of all software loaded on the computer
- E. The FSB permits the central core processor to access input/output devices and memory NOT stored in the cache.

51. What is the role of random-access memory (RAM) in a computer?
- A. RAM stores information temporarily and permits each computer byte of memory to be accessed directly.
  - B. RAM permits you to begin at the beginning of the data memory retrieval process and access each byte of memory until you get the one you desire.
  - C. RAM allows permanent storage of memory to be stored on the hard drive.
  - D. RAM regulates the integrity and security of all software loaded on to the computer.
  - E. all of the above
52. If an ad for a computer describes a memory having  $4 \times 2^{30}$  bytes, how many gigabytes of the computer are uniquely addressable?
- A. 4GB
  - B. 8GB
  - C. 16GB
  - D. 4MB
  - E. 8MB
53. If a laptop computer contains a modem having dual core processors, each of which works at as speed advertised at 2.66GHz with a FSB/6M cache, how fast can each of the processors perform its various operations?
- A. 2.6 million operations per second
  - B. 2.6 billion operations per second
  - C. 2.6 trillion operations per second
  - D. 266,000 operations per second
  - E. 2.6 billion operations per minute
54. . The prefix \_\_\_\_\_ stands for  $10^3$  (1000) or  $2^{10}$  (1024).
55. The prefix \_\_\_\_\_ stands for approximately one million.
56. The prefix \_\_\_\_\_ is abbreviated G and stands for over one billion.
57. The \_\_\_\_\_ architecture is characterized by storing a program in the same way and space as regular data.
58. A computer's \_\_\_\_\_ is the number of bits that are stored in each addressable memory location.
59. A \_\_\_\_\_ is a small storage unit in the central processing unit used to store intermediate values or special data.

60. The \_\_\_\_\_ performs basic operations in the central processing unit such as adding and subtracting, as well as logical operations such as AND and OR.
61. The \_\_\_\_\_ is in charge of the fetch-execute cycle.
62. The \_\_\_\_\_ is a register that holds the address of the next instruction to be executed.
63. The \_\_\_\_\_ is a set of wires through which data travels between the main components of a computer.
64. The primary circuit board on which the core components of a computer reside is called the \_\_\_\_\_.
65. During the first step of the fetch-execute cycle, an instruction is read from main memory and stored in the \_\_\_\_\_.
66. After being fetched, the instruction is \_\_\_\_\_, meaning the CPU circuitry determines which operation is being executed.
67. RAM stands for \_\_\_\_\_, and is generally synonymous with the main memory of a computer.
68. ROM stands for \_\_\_\_\_, which retains its contents even after the power is turned off.
69. RAM is \_\_\_\_\_, meaning its contents will be lost when the power is turned off.
70. The information on a disk drive is organized into concentric circles called \_\_\_\_\_, which are divided into sectors.
71. The information stored in on sector on a disk drive is called a \_\_\_\_\_.
72. A disk drive's \_\_\_\_\_ is the time it takes for the read/write head to move into position over the specified track.

73. \_\_\_\_\_ is the time it takes for the desired sector to rotate to the read/write head in a disk drive.
74. The tracks that line up with one another on the disks of a disk drive is called a \_\_\_\_\_.
75. A \_\_\_\_\_ stores approximately 600 MB of data, which is read optically using a laser.
76. A \_\_\_\_\_ touch screen is made up of two layers that come into contact when the user presses on the screen.
77. . A \_\_\_\_\_ touch screen has a laminate applied over the glass that conducts electricity which flows to the finger or stylus when touched.
78. \_\_\_\_\_ is a computing technique in which multiple processors apply the same program to multiple data sets at the same time.
79. \_\_\_\_\_ is a computing technique in which multiple processors each contribute one part of an overall computation.
80. . \_\_\_\_\_ is software that seeks to harm a computer and includes viruses that seek to assume control of a computer when a computer user opens and downloads a file.
81. . \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_ represent the four ordered steps in the fetch-execute processing data and instruction processing cycle.
82. . What does it mean to say that the speed of a processor is 866 MHz?
83. . What is the stored-program concept?
84. . What is a computer's addressability?
85. . What does it mean for a computer to have a 16-bit processor?
86. . What does the bit pattern 1110011 represent?
87. . How are the bits in a byte numbered?
88. What two components make up the central processing unit in a von Neumann machine?
89. What is the general role of the control unit?
90. What is the general role of the arithmetic/logic unit (ALU)?
91. What is a register?



92. What is the general purpose of a register?
93. What is the computer's bus?
94. What is the computer's motherboard?
95. What is the role of the instruction register (IR)?
96. What is the role of the program counter (PC)?
97. Name the three basic capabilities of a computer.
98. How are the contents of the program counter (PC) modified during the fetch-execute cycle?
99. What does it mean to say that RAM is volatile?
100. What is the primary drawback of a magnetic tape storage unit?
101. What is a cylinder on a disk drive?
102. How is data organized on a single hard disk?
103. . Does the amount of data stored in a sector vary depending on the track it is stored on?
104. . Are the tracks and sectors of a disk physically defined?
105. . What is the difference between seek time and latency?
106. . List the four measures of a disk drive's efficiency.
107. . Describe an address used to access data on a disk drive.
108. . How is data stored and read from a compact disc (CD)?
109. . Describe a CD-ROM.
110. . Distinguish between the format of a CD-ROM disk and a CD-DA disk.
111. . How do the tracks on a magnetic disk differ from the tracks on a CD?
112. Is the data on a CD packed more densely near the center?

113. How can a consistent transfer rate be obtained for a CD if the outer edges contain more data?
114. Compare, generally, the transfer rates of a hard disk and a floppy disk.
115. Compare, generally, the storage capacity of a hard drive and a floppy disk.
116. . Describe synchronous processing in a parallel architecture.
117. . Describe pipeline processing in a parallel architecture.
118. . Describe shared memory processing in a parallel architecture.
119. What is the chief advantage of parallel computer architectures, including synchronous processing and shared memory parallel processing, over von Neumann architecture data processing?
120. . Describe the basic characteristics of a von Neumann computer architecture.
121. . Describe the fetch-execute cycle.
122. . Compare and contrast RAM and ROM.
123. . Describe how data is organized and read on a disk drive.
124. . Explain the three primary ways that parallel-processing systems are used for more efficient problem solving.
125. Describe some of the recent examples of computer hoaxes and scams perpetrated by online predators and discuss the reasons why these online perpetrators have been so successful in ensnaring unwitting computer users, often overcoming the efforts of information technology security professionals and law enforcement officials to detect and halt their fraudulent and illegal activities.
126. What role did John Vincent Atanasoff, Ph.D. play in the development of the modern computer?

### **Solutions and answers**

1. True or False? For tasks like Web surfing, sufficient memory can make up for a slow processor.

Answer: True

2. True or False? A megabyte of memory space is larger than a gigabyte of memory space.

Answer: False

3. True or False? The prefix kilo means 1000 when referring to speed and 1024 when referring to storage.

Answer: True

4. True or False? The von Neumann architecture is characterized by the fact that instructions and data are logically the same and can both be stored in memory.

Answer: True

5. True or False? In a von Neumann architecture, the devices that store information and the devices that process information are the same.

Answer: False

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Answer: True

7. True or False? The control unit and the arithmetic/logic unit are both part of the central processing unit (CPU).

Answer: True

8. True or False? The bit pattern stored at a particular memory location conveys what kind of information it represents (a number, part of an image, etc.).

Answer: False

9. True or False? A register is a small storage area in the CPU.

Answer: True

10. True or False? The program counter is a register that stores the number of instructions executed by a computer.

Answer: False

11. True or False? The control unit manages the fetch-execute cycle.

Answer: True

12. True or False? The bus is a group of wires through which data travels within a computer.

Answer: True

13. True or False? The fetch part of the fetch-execute cycle fetches the next instruction to be executed from memory.

Answer: True

14. True or False? The CPU determines what additional data may be needed to execute an instruction.

Answer: True

15. True or False? A volatile storage device loses its memory if its power supply is turned off.

Answer: True

16. True or False? RAM is non-volatile and ROM is volatile.

Answer: False

17. True or False? Both RAM and ROM are random-access devices.

Answer: True

18. True or False? A disk drive may be composed of multiple disks.

Answer: True

19. True or False? The read/write heads of a disk drive all read from the same disk at the same time.

Answer: False

20. True or False? The seek time of a disk drive is the time it takes for the specified sector to rotate under the read/write head.

Answer: False

21. True or False? A compact disc stores data using magnetized particles.

Answer: False

22. True or False? The data on a CD-RW can be rewritten multiple times.

Answer: True

23. True or False? A touch screen is both an input and output device.

Answer: True

24. True or False? Some touch screen will not work if the user has a glove on.

Answer: True

25. True or False? Pipelining is a technique that uses several different processors, where each contributes one part to an overall computation.

Answer: True

26. Which of the following is a popular central processing unit?

- A. Hertz
- B. Pentium 4
- C. random access
- D. cycles per second
- E. modem

Answer: B

27. Which of the following means that each memory location can be accessed by its address?

- A. Hertz
- B. Pentium 4
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Answer: C

28. Which of the following is a unit of frequency?

- A. Hertz
- B. Pentium 4
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Answer: A

29. Which of the following is a device that allows a computer to connect to the Internet?

- A. Hertz
- B. Pentium 4
- C. random access
- D. cycles per second
- E. modem

Answer: E

30. The prefix *nano* refers to which power of ten?

- A.  $10^{-12}$
- B.  $10^{-9}$
- C.  $10^{-6}$
- D.  $10^{-3}$

Answer: B

31. The prefix *micro* refers to which power of ten?

- A.  $10^{-12}$
- B.  $10^{-9}$
- C.  $10^{-6}$
- D.  $10^{-3}$

Answer: C

32. The prefix *mega* refers to which power of two?

- A.  $2^{10}$
- B.  $2^{20}$
- C.  $2^{30}$
- D.  $2^{40}$
- E.  $2^{50}$

Answer: B

33. The prefix *giga* refers to which power of two?

- A.  $2^{10}$
- B.  $2^{20}$
- C.  $2^{30}$
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Answer: C

34. A von Neumann computer architecture is best characterized by which of the following?

- A. program input device
- B. read only memory
- C. random access memory

- D. stored-program concept
- E. the use of disk drives

Answer: D

35. . Addressability refers to which of the following?
- A. the number of bits stored in each addressable location
  - B. the size of each addressable location
  - C. the size of a memory address
  - D. the capacity of a memory device
  - E. the number of bytes currently holding data in a memory device

Answer: A

36. Which of the following contains the instruction register?
- A. control unit
  - B. arithmetic/logic unit
  - C. auxiliary storage device
  - D. RAM
  - E. ROM

Answer: A

37. Which of the following contains the program counter?
- A. control unit
  - B. arithmetic/logic unit
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Answer: A

38. Which of the following is volatile?
- A. control unit
  - B. arithmetic/logic unit
  - C. auxiliary storage device
  - D. RAM
  - E. ROM

Answer: D



39. Which of the following manages the fetch-execute cycle?

- A. control unit
- B. arithmetic/logic unit
- C. auxiliary storage device
- D. RAM
- E. ROM

Answer: A

40. Which of the following executes an instruction once it is decoded?

- A. control unit
- B. arithmetic/logic unit
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Answer: B

41. Which of the following best describes a register?

- A. a memory location which stores a sum
- B. a device that contains the arithmetic/logic unit
- C. a device that contains the control unit
- D. a large memory location in auxiliary storage
- E. a small memory location in the central processing unit

Answer: E

42. The instruction register is used to store which of the following?

- A. an instruction
- B. the memory location of an instruction
- C. the number of program instructions executed
- D. the number of programs executed
- E. the data used by an instruction

Answer: A

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Answer: B

44. Which of the following is referred to as the computer's bus?
- A. the device used to transfer data from auxiliary storage
  - B. the storage location for the currently executing program
  - C. the set of wires through which data travels among the core devices
  - D. the storage location for the current instruction
  - E. the number of bytes transferred from RAM to ROM

Answer: C

45. Which of the following is the time it takes for the read/write head of a disk drive to get into position over a specified track?
- A. seek time
  - B. latency
  - C. transfer rate
  - D. spindle time
  - E. access time

Answer: A

46. Which of the following is the time it takes for the specified sector to rotate to the read/write head of a disk drive?
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  - D. spindle time
  - E. access time

Answer: B

47. Which touch screen technology uses a laminate that conducts electricity and causes current to flow to a finger or stylus when touched?
- A. resistive touch screen
  - B. capacitive touch screen
  - C. infrared touch screen
  - D. addressable touch screen
  - E. surface acoustic wave touch screen

Answer: B

48. Which parallel-processing approach applies the same program to multiple data sets using multiple processors?

- A. synchronous processing
- B. tandem processing
- C. pipelining processing
- D. transfer processing
- E. decode processing

Answer: A

49. What does the term *Core™ Duo* refer to in the description of the components of the **Instavialion 640 Laptop**?

- F. the presence of two central core processors in the laptop computer
- G. the presence of two central core lithium batteries in the laptop computer
- H. the presence of two central hard drives in the laptop computer
- I. the presence of two front side buses (FSBs) in the laptop computer
- J. the presence of two software operating systems in the laptop computer

Answer: A

50. What is the function of the front side bus (FSB) in a computer?

- F. The FSB activates access to the megabytes of memory stored in the computer's cache.
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- I. The FSB protects the integrity and security of all software loaded on the computer
- J. The FSB permits the central core processor to access input/output devices and memory NOT stored in the cache.

Answer: E

51. What is the role of random-access memory (RAM) in a computer?

- F. RAM stores information temporarily and permits each computer byte of memory to be accessed directly.
- G. RAM permits you to begin at the beginning of the data memory retrieval process and access each byte of memory until you get the one you desire.
- H. RAM allows permanent storage of memory to be stored on the hard drive.
- I. RAM regulates the integrity and security of all software loaded on to the computer.
- J. all of the above

Answer: A

52. If an ad for a computer describes a memory having  $4 \times 2^{30}$  bytes, how many gigabytes of the computer are uniquely addressable?

- F. 4GB
- G. 8GB
- H. 16GB

- I. 4MB
- J. 8MB

Answer: A

53. If a laptop computer contains a modem having dual core processors, each of which works at as speed advertised at 2.66GHz with a FSB/6M cache, how fast can each of the processors perform its various operations?

- F. 2.6 million operations per second
- G. 2.6 billion operations per second
- H. 2.6 trillion operations per second
- I. 266,000 operations per second
- J. 2.6 billion operations per minute

Answer: B

54. . The prefix \_\_\_\_\_ stands for  $10^3$  (1000) or  $2^{10}$  (1024).

Answer: Kilo

55. The prefix \_\_\_\_\_ stands for approximately one million.

Answer: Mega

56. The prefix \_\_\_\_\_ is abbreviated G and stands for over one billion.

Answer: Giga

57. The \_\_\_\_\_ architecture is characterized by storing a program in the same way and space as regular data.

Answer: von Neumann

58. A computer's \_\_\_\_\_ is the number of bits that are stored in each addressable memory location.

Answer: Addressability

59. A \_\_\_\_\_ is a small storage unit in the central processing unit used to store intermediate values or special data.

Answer: Register

60. The \_\_\_\_\_ performs basic operations in the central processing unit such as adding and subtracting, as well as logical operations such as AND and OR.

Answer: arithmetic/logic unit

61. The \_\_\_\_\_ is in charge of the fetch-execute cycle.

Answer: control unit

62. The \_\_\_\_\_ is a register that holds the address of the next instruction to be executed.

Answer: program counter (PC)

63. The \_\_\_\_\_ is a set of wires through which data travels between the main components of a computer.

Answer: Bus

64. The primary circuit board on which the core components of a computer reside is called the \_\_\_\_\_.

Answer: Motherboard

65. During the first step of the fetch-execute cycle, an instruction is read from main memory and stored in the \_\_\_\_\_.

Answer: instruction register (IR)

66. After being fetched, the instruction is \_\_\_\_\_, meaning the CPU circuitry determines which operation is being executed.

Answer: Decoded

67. RAM stands for \_\_\_\_\_, and is generally synonymous with the main memory of a computer.

Answer: random access memory

68. ROM stands for \_\_\_\_\_, which retains its contents even after the power is turned off.

Answer: read-only memory

69. RAM is \_\_\_\_\_, meaning its contents will be lost when the power is turned off.

Answer: Volatile

70. The information on a disk drive is organized into concentric circles called \_\_\_\_\_, which are divided into sectors.

Answer: Tracks

71. The information stored in on sector on a disk drive is called a \_\_\_\_\_.

Answer: Block

72. A disk drive's \_\_\_\_\_ is the time it takes for the read/write head to move into position over the specified track.

Answer: seek time

73. \_\_\_\_\_ is the time it takes for the desired sector to rotate to the read/write head in a disk drive.

Answer: Latency

74. The tracks that line up with one another on the disks of a disk drive is called a \_\_\_\_\_.

Answer: Cylinder

75. A \_\_\_\_\_ stores approximately 600 MB of data, which is read optically using a laser.

Answer: compact disc (CD)

76. A \_\_\_\_\_ touch screen is made up of two layers that come into contact when the user presses on the screen.

Answer: resistive

77. . A \_\_\_\_\_ touch screen has a laminate applied over the glass that conducts electricity which flows to the finger or stylus when touched.

Answer: capacitive

78. \_\_\_\_\_ is a computing technique in which multiple processors apply the same program to multiple data sets at the same time.

Answer: synchronous processing

79. \_\_\_\_\_ is a computing technique in which multiple processors each contribute one part of an overall computation.

Answer: Pipelining

80. . \_\_\_\_\_ is software that seeks to harm a computer and includes viruses that seek to assume control of a computer when a computer user opens and downloads a file.

Answer: Malware

81. . \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_ represent the four ordered steps in the fetch-execute processing data and instruction processing cycle.

Answer: 1) Fetch the next instruction 2). decode the instruction (and upgrade the program counter) 3) get data (operand) if needed 4). execute the instruction

82. . What does it mean to say that the speed of a processor is 866 MHz?

Answer: The processor cycles 866,000,000 times per second, which is related to the number of instructions it can process per unit time.

83. . What is the stored-program concept?

Answer: the idea that data and instructions can be treated logically the same. It is the primary characteristic of a von Neumann architecture.

84. . What is a computer's addressability?

Answer: The number of bits stored in each addressable location in memory.

85. . What does it mean for a computer to have a 16-bit processor?

Answer: The processor can distinguish among  $2^{16}$  different memory locations.

86. . What does the bit pattern 1110011 represent?

Answer: It's not possible to determine what a bit pattern represents; an interpretation of some kind must be applied.

87. . How are the bits in a byte numbered?

Answer: From right to left beginning with 0.

88. . What two components make up the central processing unit in a von Neumann machine?

Answer: The control unit and the arithmetic/logic unit.

89. . What is the general role of the control unit?

Answer: It manages the fetch-execute cycle, the most fundamental level of processing in a computer.



90. What is the general role of the arithmetic/logic unit (ALU)?

Answer: It performs basic mathematical and logical operations.

91. What is a register?

Answer: A high-speed storage unit in the central processing unit that can hold only one word of data.

92. What is the general purpose of a register?

Answer: A register is used to store intermediate values or special data where it can be accessed quickly.

93. What is the computer's bus?

Answer: The set of wires through which data moves between the primary components of a computer.

94. What is the computer's motherboard?

Answer: The main circuit board of a personal computer, containing its primary components.

95. What is the role of the instruction register (IR)?

Answer: It holds the instruction currently being executed.

96. What is the role of the program counter (PC)?

Answer: It holds the address of the next instruction to be executed.

97. Name the three basic capabilities of a computer.

Answer: A computer can store, retrieve, and process data.

98. How are the contents of the program counter (PC) modified during the fetch-execute cycle?

Answer: After an instruction is fetched, the PC is incremented to point to the next consecutive instruction. This address may be modified by the current instruction, however.

99. What does it mean to say that RAM is volatile?

Answer: The contents of RAM will be lost when the power to the device is turned off.

100. What is the primary drawback of a magnetic tape storage unit?

Answer: To access the data in the middle of the tape, all the intervening data must be bypassed, which is time-consuming.

101. What is a cylinder on a disk drive?

Answer: The set of tracks that line up directly under one another on multiple disks of a disk drive, which can be accessed at one time via the read/write heads.

102. How is data organized on a single hard disk?

Answer: The data on a disk is organized into concentric circles called tracks, and each track is divided into sectors. Each sector stores one block of data.

103. Does the amount of data stored in a sector vary depending on the track it is stored on?

Answer: No. Even though the length of a sector near the center of the disk is smaller than those toward the outer edge, the amount of data in each is the same. The data in smaller sectors is more densely packed.

104. Are the tracks and sectors of a disk physically defined?

Answer: No. They are an organizational technique marked magnetically when the disk is formatted.

105. What is the difference between seek time and latency?

Answer: Seek time is the time it takes for the read/write head to get positioned over the specified track. Latency is the time it takes for the specified sector to rotate into position under the read/write head.

106. . List the four measures of a disk drive's efficiency.

Answer: Seek time, latency, access time, and transfer rate.

107. . Describe an address used to access data on a disk drive.

Answer: The address is composed of the cylinder number, the surface number, and the sector.

108. . How is data stored and read from a compact disc (CD)?

Answer: The data on a CD is stored optically and read by a laser.

109. . Describe a CD-ROM.

Answer: A CD-ROM is a compact disk on which the data is permanent. ROM stands for read-only memory, so you can read from the disk, but you cannot write to the disk.

110. . Distinguish between the format of a CD-ROM disk and a CD-DA disk.

Answer: A CD-ROM disk and a CD-DA disk are formatted the same. Certain fields in the format of a CD-DA disk are used for timing information instead of data as in the CD-ROM disk.

111. . How do the tracks on a magnetic disk differ from the tracks on a CD?

Answer: A magnetic disk has many tracks, but the CD has only one that spirals from the inside out.

112. . Is the data on a CD packed more densely near the center?

Answer: No. The data on a CD is uniformly packed, so more data is stored in the track on the outer edges.

113. . How can a consistent transfer rate be obtained for a CD if the outer edges contain more data?

Answer: The rotation speed of a CD varies depending on the position of the laser beam, thus providing a consistent transfer rate.

114. . Compare, generally, the transfer rates of a hard disk and a floppy disk.

Answer: Transfer rates for a hard drive are much faster, expressed in megabytes per second, whereas transfer rates for floppy disks are expressed in kilobytes per second.

115. . Compare, generally, the storage capacity of a hard drive and a floppy disk.

Answer: The storage capacity of a hard drive is much larger, expressed in gigabytes, whereas the storage capacity of a floppy disk is expressed in megabytes.

116. . Describe synchronous processing in a parallel architecture.

Answer: Synchronous processing is multiple processors applying the same program in lockstep to multiple data sets.

117. . Describe pipeline processing in a parallel architecture.

Answer: Pipeline processing is multiple processors arranged in tandem, where each contributes one part of an overall computation.

118. . Describe shared memory processing in a parallel architecture.

Answer: Shared memory processing is multiple processors sharing a global memory.

119. What is the chief advantage of parallel computer architectures, including synchronous processing and shared memory parallel processing, over von Neumann architecture data processing?

Answer: These parallel computer architectures are configured in ways that significantly increase the data processing speed than is the case with the von Neumann architecture. Operations can be executed in parallel or pipelined to make the process faster.

120. . Describe the basic characteristics of a von Neumann computer architecture.

Answer: The fundamental characteristic of a von Neumann architecture is that data and instructions are logically the same. The central processing unit is made up of a control unit that manages the constantly repeated fetch-execute cycle, and the arithmetic/logic unit that performs core mathematical and logical operations. During the fetch-execute cycle, instructions and data are obtained from memory and

processed. Peripheral devices such as I/O devices and secondary storage units are used as necessary.

121. . Describe the fetch-execute cycle.

Answer: The fetch-execute cycle forms the core processing of a computer. First a machine level instruction is fetched from memory at the address stored in the program counter (PC). It is stored temporarily in the instruction register (IR) during processing. The PC is incremented to point to the next instruction, though this may be changed by the current instruction's processing. Then the instruction is decoded, using the circuitry of the CPU, to determine what operation is to be executed. As needed, additional data may be obtained from memory. Then the instruction is executed via the circuitry of the arithmetic/logic unit.

122. . Compare and contrast RAM and ROM.

Answer: RAM and ROM are both memory devices. RAM, which stands for random access memory, is generally synonymous with the main memory of the computer, used for all active processing. The contents of ROM, or read-only memory, are fixed initially and cannot be changed by normal program operations. RAM is volatile, meaning its data will be lost if the power is turned off to the device, whereas ROM is non-volatile. Despite the implications of their names, both RAM and ROM are random access devices, meaning the data can be retrieved directly without moving past intermediate data.

123. . Describe how data is organized and read on a disk drive.

Answer: A disk drive may have multiple hard disks on which data is stored. A set of read/write heads move in unison across each disk while the disks spin. The storage space on each disk is separated into concentric tracks, which are further divided into arced sections called sectors. To access a particular piece of data, the read heads are moved to the correct track and the disk must spin to position the correct sector under the read head. For a disk drive with multiple disks, consecutive data may be stored on corresponding tracks on multiple disks (which form a cylinder) to minimize the movement needed by the read heads to access the data.

124. . Explain the three primary ways that parallel-processing systems are used for more efficient problem solving.

Answer: Parallel-processing systems may use synchronous processing, in which multiple processors apply the same program in lock-step to multiple data sets. Large data sets are therefore processed much faster. In pipelining, however, the multiple processors are each used to contribute one part of a larger computation. Thus the first processor performs its part of the computation on the second set of data at the same time the second processor is doing its part on the first data set. Eventually, the pipeline of processors is filled and each processor is working in parallel. In shared-memory processing, multiple processors share a global memory and do different things with different data.

125. Describe some of the recent examples of computer hoaxes and scams perpetrated by online predators and discuss the reasons why these online perpetrators have been so successful in ensnaring unwitting computer users, often overcoming the efforts of information technology security professionals and law enforcement officials to detect and halt their fraudulent and illegal activities.

Answer: Fraudulent Internet auctions, bogus Internet access services, credit card fraud, international model dialing, Web cramming, international model dialing, multi-level marketing plans/pyramids, phony business opportunities/investments, deceiving healthcare products and services, misleading travel and vacation offers, and phishing scams to obtain confidential financial and personal information are among the most common computer hoaxes and scams recently perpetrated by online criminals. Perpetrators of these online hoaxes and scams are able to use computer technologies to disguise not just their personal identities, but also their geographic locations to evade detection by information technology security professionals and prosecution by law enforcement. Computer users who fail to take critical precautions such as refusing to give out credit card or other personal information to untrusted websites and email solicitors often become victims of the fraudulent schemes of these online perpetrators.

126. What role did John Vincent Atanasoff, Ph.D. play in the development of the modern computer?

Answer: As a professor of mathematics and physics at Iowa State University, Dr. Atanasoff, in 1939, developed a very early prototype of a computer, the Atanasoff Berry Computer (ABC). This computer was electronically operated and computed by direct logical action, rather than enumeration, as analog devices. Moreover, Dr. Atanasoff's computing device used binary numbers instead of decimal numbers, condensers for memory, and a regenerative process to avoid lapses in memory. Two scientists, who became familiar with Atanasoff's ABC computer through a visit to Dr. Atanasoff's lab to see a demonstration of the computer and research papers provided by Dr. Atanasoff, subsequently developed in 1945 the EINAC, the first general purpose electronic computer used in the world. After prolonged litigation in the courts over patent infringement claims regarding the use of ABC technology by the EINAC developers, a federal court in 1947 ruled that Dr. Atanasoff, contrary to the competing claims of the developers of the EINAC, could legitimately claim to have first invented the automatic electronic digital computer.