Chapter1

1. With a 1 on the upper input and a 0 on the lower input, all circuits will produce an output 0. If instead a 0 is on the upper input and 1 is on the lower input, circuits b and c will produce an output 1, and circuit a will still produce a 0.

7. a. 0   b. 1   c. 0   d. 0   e. 1

9.   a. 546   b. 859   c. 435

10. The image consists of 1024 x 1024 = 1,048,576 pixels and therefore 4 x 1,048,576 = 4,194,304 bytes, or about 4MB. This means that about 128 images could be stored in the 512MB camera storage system.

13. There are 160GB of material on the hard-disk drive. At least 40 4GB flash drives would be required to store all of it. That does not seem practical as it is not cost-effective. On the other hand, DVDs have capacities of about 4.7GB, meaning that only about 35 DVDs would be required. This may still be impractical but cost-effective. Finally, 20 8GB flash drives would be necessary, which is also not very cost-effective.

16. The latency time of a disk spinning at 360 revolutions per second is only 0.00138 seconds.

19. It is unknown!

25. The Hamming distance can be defined as the number of bits in which the binary bit pattern differs.

Chapter2

5.

Program counter	Instruction register	Memory cell at 02
02	2211	32
04	3202	32
06	C000	11

6. To compute a - b + c, each of the values must be retrieved from memory and placed in a register, the difference of a and b must be computed and saved in another register, c must be added to that sum, and the final answer must be stored in memory.

   A similar process is required to compute (2a) + (2y). The point of this example is that the multiplication by 2 is accomplished by adding x to x and y to y.

8. 64 with 6 bits, 256 with 8 bits.

11.   a. Changes the contents of memory cell 3C.

   b. Is independent of memory cell 3C.

   c. Retrieves from memory cell 3C.

   d. Changes the contents of memory cell 3C.

   e. Is independent of memory cell 3C.

14.   a. Load register 2 with the contents of memory cell 02.
       Store the contents of register 2 in memory cell 42.
       Halt.

   b. 32

   c. 06

19. On some machines this is a two-step process consisting of first reading the contents from the first cell into a register and then writing it from the register into the destination cell. It may also be accomplished as one activity without using an intermediate register.

27. Mass storage is used to hold data that will likely not be needed in the near future; main memory is used to hold data that will be needed in the near future; and general-purpose registers are used to hold the data immediately applicable to the operation at hand.
The idea of storing a computer's program in its main memory is called the stored-program concept   and it overcomes the limitation that the steps that each device executed were built into the control unit as a part of the machine.

29.   Machine instruction consists of two parts: the op-code (short for operation code) field and the operand field.

Chapter3

1. Control data and its access, provide for efficient device access, coordinate the use of the machine's resources, and control access to the machine.

2. Batch processing refers to the process of collecting a program (or programs) together with data and submitting this material to the operating system for execution (perhaps at a later time) without further intervention by the user. A real time system has well defined, fixed time constraints. Real time processing must be done within the defined constraints, or the system will fail. It is often used as a control device in a dedicated application.

9. A is a directory containing the subdirectory B, which contains the file One.txt.

13. Virtual memory is a technique that allows the execution of processes that may not be completely in memory. It is the separation of user logical memory from physical memory. This separation provides an extremely large virtual memory when only a smaller physical memory is available.

14. To create a 1024MB (MiB) virtual memory using 2KB (KiB) pages would require 524,288 pages.

18. The BIOS provides basic information about storage devices, boot sequence, security to the system.

24. A process requests resources; if the resources are not available at that time, the process enters a wait state. Waiting processes may never again change state, because the resources they have requested are held by other waiting processes. This situation is called a deadlock

30. When an interrupt signal occurs machine completes its currently executing instruction, saves the current program state and begins executing the interrupt routine.