Introduction to Computer Science-102

Midterm

1. Convert the following decimal numbers to hexadecimal without using a calculator, showing your work. (6%)
   a. 1411 $(583)_{16}$
   b. 16.5 $(10.8)_{16}$

2. In a computer, the ___ input/output___subsystem accepts data and programs and sends processing results to output device. (6%)

3. Show the result of the following operations assuming that the numbers are stored in 16-bit two's complement representation. Show the result in hexadecimal notation. (6%)
   a. $(E12A)_{16} + (9E27)_{16}$

														Carry	Hexadecimal
	1							1		1	1				
	1	1	1	0	0	0	0	1	0	0	1	0	1	0	E12A
+	1	0	0	1	1	1	1	0	0	0	1	0	0	1	9E27
	0	1	1	1	1	1	1	1	0	1	0	1	0	0	17F51

Note that the result is not valid because of overflow.

   b. $(712A)_{16} + (9E00)_{16}$

														Carry	Hexadecimal
1	1	1	1												
	0	1	1	1	0	0	0	1	0	0	1	0	1	0	712A
+	1	0	0	1	1	1	1	0	0	0	0	0	0	0	9E00
	0	0	0	0	1	1	1	1	0	0	1	0	1	0	10F2A

4. Convert the following octal numbers to hexadecimal without using a calculator, showing your work. (6%)
   a. $(16.7)_8$ $(E.E)_{16}$
   b. $(1326)_8$ $(2D6)_{16}$

5. Find the minimum number of digits needed in the destination system for each of the following cases: (6%)
   a. 5-bit binary number converted to decimal.

$\lceil \log_{10} 2^5 \rceil = \lceil 1.5 \rceil = 2$

b. Three-digit hexadecimal number converted to decimal.

$\lceil \log_{10} 16^3 \rceil = \lceil 3.612 \rceil = 4$

6. Change the following decimal numbers to 16-bit two's complement integers. (6%)

   a. 153 0000 0000 1001 1001

   b. 74256 overflow

7. Addition and subtraction of real numbers stored in floating-point numbers is reduced to addition subtraction of two integers stored in sign-and-magnitude (combination of sign and mantissa) after the alignment of decimal points.
   Show the computer finds the result of (-6.875)+(+142.625)=+135.75 (10%)

8. Convert the following numbers in 32-bit IEEE format. (6%)

   a. -14.640625 1 10000010 11010100100000000000000

   b. 13.40625 0 10000010 10101101000000000000000

9. We need to unset (force to 0) the four leftmost bits and set (force to 1) the three rightmost bits of a pattern. Show the masks and the operations. (6%)

   Mask=0000XXXXX111

10. What a specific duty does the network layer have? And what does the duty mean? (6%)

    The network layer is responsible for the source-to-destination (computer-to-computer or host-to-host) delivery of a packet, possibly across multiple networks (links). The network layer ensures that each packet gets from its point of origin to its final destination.

11. A computer uses memory-mapped I/O addressing. The address bus uses 11 lines (10 bits). If memory made up of 2,000 words, how many three-register controllers can be accessed by the computer. (6%)

    2048-200=48 48/3=16

12. Show the result of the following floating-point operations using IEEE_127. (6%)

    a. -344.3125 – 123.5625

->1 10001000 11101001111100000000000

-> $-(111010011.111)_2 = -468.875$

b. 34.75 + 23.125

->0 10000101 11100111100000000000000

->$+(111001.111)_2 = 57.875$

13. What do the protocols mean? And what are their functions? (6%)

To divide the services required to perform a task, the Internet has created a set of rules called protocols. These allow different local and wide area networks, using different technologies, to be connected together and carry a message from one point to another

14. How many bits are needed in a 50-pixel image using True-Color encoding? (6%)

50*24=1200

15. An imaginary computer has sixteen data registers (R0 to R15), 2048 words in memory, and 32 different instructions (add, subtract, and so on). What is the minimum size of an instruction in bits if a typical instruction uses the following format: Instruction M R2 . (6%)

4+11+5=20

16. What is the main function of the transport layer in the TCP/IP protocol suite? What type of addresses is used in this layer? (6%)

The transport layer is responsible for process-to-process delivery of the entire message: logical communication is created between the transport layer of the client and the server computer.

The server computer may be running several processes at the same time, for example an FTP server process and an HTTP server process. When the message arrives at the server, it must be directed to the correct process. We need another address for server process identification, called a port number.