CIS-350 – INFRASTRUCTURE TECHNOLOGIES

SMALL GROUP ACTIVITY #2

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Logistics

1. Get in touch with your group of 4 or 5 students. (See Groups folder on Blackboard.)
2. Discuss and complete the assignment together via E-mail, Discussion Forum, Blackboard Collaborate Ultra, and/or MS Teams.
3. Choose a recorder to prepare the final copy (one per group) and submit it via the Blackboard Assignments/Small Group Activities folder to the instructor.
4. Be sure all group members' names are on final copy. Do not add names of your group classmates who did not participate in the assignment.

Topics: Data formats, computer representation of unsigned and signed numbers (2's complement form), and decimal ranges

Assignment One

1. How would string "King" be represented in the EBCDIC standard? Give the hexadecimal, decimal, and binary forms for the EBCDIC standard.

	K	i	n	g
Hexadecimal	$(D2)_{16}$	$(89)_{16}$	$(95)_{16}$	$(87)_{16}$
Decimal	$(210)_{10}$	$(137)_{10}$	$(149)_{10}$	$(135)_{10}$
Binary	$(11010010)_2$	$(10001001)_2$	$(10010101)_2$	$(10000111)_2$

$(D2)_{16} = (13*16^1) + (2*16^0) = (210)_{10}$
$(89)_{16} = (8*16^1) + (9*16^0) = (137)_{10}$
$(95)_{16} = (9*16^1) + (5*16^0) = (149)_{10}$
$(87)_{16} = (8*16^1) + (7*16^0) = (135)_{10}$

	IQ	R			IQ	R			IQ	R			IQ	R
210:2	105	0		137:2	68	1		149:2	74	1		135:2	67	1
105:2	52	1		68:2	34	0		74:2	37	0		67:2	33	1
52:2	26	0		34:2	17	0		37:2	18	1		33:2	16	1
26:2	13	0		17:2	8	1		18:2	9	0		16:2	8	0
13:2	6	1		8:2	4	0		9:2	4	1		8:2	4	0
6:2	3	0		4:2	2	0		4:2	2	0		4:2	2	0
3:2	1	1		2:2	1	0		2:2	1	0		2:2	1	0
1:2	0	1		1:2	0	1		1:2	0	1		1:2	0	1

2. How many bytes does the string "Bear" occupy? (Do not count the double quotes.)

In EBCDIC: 4 bytes In Unicode: 8 bytes (UTF-16 standard)

	B	e	a	r
Hexadecimal	$(C2)_{16}$	$(85)_{16}$	$(81)_{16}$	$(99)_{16}$

Binary	$(11000010)_2$	$(10000101)_2$	$(10000001)_2$	$(10011001)_2$

(32 / 8) = 4

Assignment Two

1. Each pixel in an image can display 256 levels of gray. What is the size (in bytes) of the video memory to store the image containing 1,920 × 1,080 pixels? (1,920 × 1080) is a resolution of a high-definition Dell monitor.)

1920 * 1080 * 1 = **2,073,600 bytes**

2. How many bytes would you need to store the true color image of the size 1,920 × 1,080 pixels? Note: In the true color image you need 3 bytes for each pixel.

1920 * 1080 * 3 = **2,359,296 bytes**

3. A Dell monitor with a high-definition resolution 1,920 × 1,080 pixels generates true color images at a frame rate of 120 frames/sec. How much storage expressed in GB would a 3-minute video clip displayed on this monitor consume?

1920 * 1080 * 3 * 120 = 746,496,000 Bytes/sec = 729000 KB/sec = 711.91 GB/sec

180 * 711.91 = 128143.8 / 1024 = **125.14 GB**

Assignment Three

1. Convert this 8-bit number written in 2's complementary binary form

$(11101001)_2$

to the decimal number $(-23)_{10}$

Note: Because the leftmost bit (the sign bit) is 1, the number is negative! The leftmost bit 1 is worth $-1*2^7$. It contributes to the sign and the magnitude of the number.

$1 * 2^0 + 0 * 2^1 + 0 * 2^2 + 1 * 2^3 + 0 * 2^4 + 1 * 2^5 + 1 * 2^6 - 1 * 2^7 = 105-128 = -23$

Assignment Four

Assume that some computers used a 17-bit word to store numbers. What is the decimal range for this word size for:

(a) unsigned numbers: [0,2^17-1] = [0,131071]

(b) signed numbers: [-2^16,2^16-1] = [-65536,65535]

What is the number of unique patterns 17 bits can store? 2^17=131072 unique patterns