**CIS 350 – INFRASTRUCTURE TECHNOLOGIES**

**GROUP HOMEWORK #3**

**Topics: Data Formats and Standards, Representing Numerical Data, Computer Representation of Unsigned and Signed Numbers (2’s Complement Form), and Decimal Ranges for Numbers. (Chapters 4-5)**

Worth – 70 points. (Each question is worth 10 points).

Write the Group # and Names of Group Members:

Group # 9, Luke Johnson, Stefan Vuleta, Ty Mcphail, Alex Rodriguez

Logistics

1. Get in touch with your group. (See Groups folder on Blackboard.)
2. Discuss and work **all** 7 problems collectively with your group via E-mail, Discussion Forum, Blackboard Collaborate Ultra, and/or MS Teams. (Do not divide the work among the group members. If you collaborate on all problems, you may do better on the tests.)
3. Choose a recorder to prepare the final copy (**one per group**) and submit it via the Blackboard Assignments/Homeworks folder by the due date. You must provide answers on these sheets.
4. Be sure all group members’ names are on the final copy. Do **not** add names of your group members who did not participate in the assignment or whose contribution was minimal.

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | B | e | s | t |
| Hexadecimal | 42 | 65 | 73 | 74 |
| Decimal | 66 | 101 | 114 | 116 |
| Binary | 01000010 | 01100101 | 01110011 | 01110100 |

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

In ASCII: \_\_\_4\_\_\_\_\_\_\_\_\_\_ In Unicode: \_\_\_\_\_\_8\_\_\_\_\_\_\_ (UTF-16 standard)

2. A high-definition 34” Dell S3422DWG monitor has the resolution 3,440 × 1440 pixels. You can see the monitor at the following link. [Dell 34 Inch WQHD Curved LCD Gaming Monitor - S3422DWG | Dell USA](https://www.dell.com/en-us/shop/dell-34-curved-gaming-monitor-s3422dwg/apd/210-azep/monitors-monitor-accessories)

1. What is the size in bytes and MB of the video memory to store the true color image of the size 3,440 × 1,440 pixels displayed on this monitor? (Note that in the true color image you need 3 bytes for each pixel.

14,860,800 bytes and 14.17 MB

1. This Dell monitor with a resolution 3,440 × 1,440 pixels generates true color images at a frame rate of 120 frames/sec. How much storage expressed in GB would a 4-minute video clip displayed on this monitor consume?

398.6 GB

3. Approximately how many images of the size 4MB can be stored on the following devices:

(a) a 4.7GB DVD-ROM, and

(b) the Samsung 2TB (terabyte) Solid State Drive (SSD)?

(You must show your calculations! Note that 1GB = 1024 MB, 1TB = 1024 GB.

1. 4.7GB DVD-ROM

**1GB = 1024 MB**

**4.7 x 1024 MB = 4812.8 MB, rounded 4813 MB**

**# of images = DVD-ROM Capac. (MB) / Image Size (MB)**

**4813 / 4 = 1203.25, 1203 images rounded**

1. 2TB SSD

**1TB = 1024 GB**

**2TB = 2 x 1024 GB = 2048 GB**

**2048 GB x 1024 MB = 2097152 MB**

**2097152/4 = 524288 images**

4. An analog wave representing the song titled “Shallow” by Lady Gaga and Bradley Cooper from the movie “A Star is Born” <https://www.youtube.com/watch?v=3Z7ddmHlbdU> is sampled

with the frequency of 44,100 Hz during its conversion from the analog form to the digital form. Assume that each sample is stored in 2 bytes. (Before you work this exercise, you may click on the above link to listen to this song.) You must show your calculations!

How many MB would it take to store 4 minutes and 18 seconds of the uncompressed sound?

**258 \* 88.2 KB = 22755.6 KB / 1000 = 22.76 MB or 22.8 MB**

If a compression ratio is 20:1, how many MB would that sound occupy after compression.

22.8 / 20 = 1.14 MB

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

(10010110)2

to the decimal number (-106)10

Note: Because the leftmost bit (the sign bit) is 1, the number is negative! The leftmost bit 1 is worth -1\*27. It contributes to the sign and the magnitude of the number.

6. Assume that some computers used a 20-bit word to store numbers. What is the decimal range for this word size for:

(a) unsigned numbers: \_\_\_\_\_[0, 1048575]\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(b) signed numbers: \_\_\_\_\_\_\_\_\_\_\_\_\_\_[-524288, 524587]\_\_\_\_\_\_\_\_\_\_\_

What is the number of unique patterns 20 bits can store? \_\_\_1048576\_\_\_\_\_\_\_\_\_\_\_\_\_\_

7. Find the 16-bit (2-byte) 2’s complementary binary representation for the decimal number

(-20)10. (Note that when you convert the 1’s complement to the 2’s complement a carry maybe generated. You must show your calculations!

20 in binary is 10100 or 0000000000010100

1’s complement: invert

= 1111111111101011

2’s complement: Add carry of 1 to least significant

= (1111111111101100)2