**CSE 3302: Programming Languages**

**Spring 2018**

**Homework 07**

**Due on Nov 8, 2018 [ before 11:59 pm]**

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**Date: 11/08/2018**

**INSTRUCTIONS**

1. **Do NOT plagiarize.**
2. **No group-work. All work should be your own.**
3. **Do not discuss your work with other students in the class.**
4. **Cite sources where necessary.**
5. **Turn in your word document using Blackboard. Do not email your documents.**
6. **Name your document as netid.docx where *netid* is your UTA NetID. If you do not know your NetID, check what it is using NetID Self Service. Your 1000 number is NOT your NetID.**
7. **Try to answer each question within a few lines.**

**Questions:**

**1.** Give a brief description of the CRT monitor technology. **[10 points]**

**Electrons shoot out of an electron gun to a phosphor-coated screen. The electrons can be placed in a desired position using electromagnetic fields. When the electrons hit the phosphor on the screen, the electrons glow, creating an image.**

**2.** How is image data stored in computers? **[6 points]**

**Image data is stored as a list of pixel values. Pixel values consist of three values that range from 0-255 that represent the intensity of red, blue, and green within the pixel.**

**3.** What is the Huffman tree? **[6 points]**

**Compression technique that takes the frequency of blocks of data and forms a tree based on their frequencies. The least frequent blocks of data are positioned at the bottom of the tree and the most frequent blocks are positioned at the top of the tree. Each branch is assigned a value of 1 or 0 and the traversal of the branches to the block of data becomes that block of data’s codeword.**

**4.** Show 5 popular command line commands in Linux. **[10 points]**

**ls, cd, rm, mv, mkdir**

**5.** What is 'QWERTY'? How did it become popular? **[6 points]**

**QWERTY is the layout of the letters on the keyboard of the typewriter created by Christopher Latham Sholes. Because Sholes’ typewriter became so popular, people have been less inclined to learn other keyboard layouts that have been proposed for the last 100+ years.**

**6.** Describe run-length compression; show an example to demonstrate. **[12 points]**

**Run-length compression reduces the amount of redundant data by adding a run length byte before a set of data, the system will then interpret that there is run of identical data that is equal to the value of the run length byte. For example, if there are 7 consecutive yellow pixels in an image, a run length byte that is equal to 7 will be placed before the data that represents a yellow pixel.**

**7.** Show the advantages of using command line interfaces. When will you use it? **[9 points] Command line interfaces are great for creating software. It is much easier to send arguments to your program and communicating with a server. Right now I’m using a command line interface in Linux in my Fundamentals of Software Engineering class, each person in my group does their part on our project then pushes the code to Bitbucket for all of the members in the group to use.**

**8.** What is the screen buffer? **[8 points]**

**Portion of computer memory that is reserved for graphics.**

**9.** How the cold war and consumerism help to boost the development of computer technology? **[15 points]**

**During the Cold War, the United States were in constant competition with the USSR to have the best technology. The USSR sending the first satellite and the first man in to space motivated the US to send the first man to the moon, which increased government spending and the effort of development of computer technology. On the consumerism side of things, Japan came to dominate the semiconductor market creating the cheapest integrated circuits on the market. This led to the creation of handheld calculators that sold by the millions. In order to compete with Japanese products and avoid bankruptcy, US companies began to reduce cost of manufacturing. The popularity of integrated circuit products like handheld calculators and the severely reduced cost of manufacturing led to the creation of the first home computing devices.**

**10.** What’s a typical compression rate of using MPG-4 to compress a video?**[5 points]**

**20 to 200 times smaller.**

**11.** Is JPEG a lossless compression method? Why? **[6 points]**

**No. It is unnecessary to keep all the data of an image because our eyes can’t detect very subtle changes in color. JPEG takes blocks of 8x8 pixels and reduces the amount of shades of color within those blocks. This drastically reduces the amount of data with people not knowing that changes have been made most of the time.**

**12.** Show a redundancy example for representing videos. **[7 points]**

**When a camera is recording a video, if there are areas within the frame that are staying the same, those areas are not re-transmitted. This is temporal redundancy.**

**Extra credit (bonus question):**

**1.** How can computers help humans? Show some examples. **[10 points]**

**Computers were created to increase the quality of life for humans. Whether it was looms in the 1800s that created a patterned tapestry or a home computer today, the purpose remains the same. A computer’s purpose is to complete a task much faster and with much less effort than a human can. I would’ve never passed my Calculus II course without a computer. Calculating integrals can get very complicated and because my computer can calculate any integral and show step by step how to solve that integral, I was able to pass Calculus II.**