Homework 1 Unix Command-Line Interface Due Sep 4 11:59PM

1: Binary representation of decimal (20 pts)

Determine the binary numbers which represent the following integers:

11_{10}: **1011_2**

Division by 2	Quotient	Remainder
11/2	5	1
5/2	2	1
2/2	1	0
1/2	0	1

1100_{10}: **10001001100_2**

Division by 2	Quotient	Remainder
1100/2	550	0
550/2	275	0
275/2	137	1
137/2	68	1
68/2	34	0
34/2	17	0
17/2	8	1
8/2	4	0
4/2	2	0
2/2	1	0
1/2	0	1

293_{10}: **100100101_2**

Division by 2	Quotient	Remainder
293/2	146	1
146/2	73	0
73/2	36	1
36/2	18	0
18/2	9	0
9/2	4	1
4/2	2	0
2/2	1	0
1/2	0	1

97_{10}: $\mathbf{1100001_2}$

Division by 2	Quotient	Remainder
97/2	48	1
48/2	24	0
24/2	12	0
12/2	6	0
6/2	3	0
3/2	1	1
1/2	0	1

Show all work for credit.

1: Decimal representation of binary (20 pts)

Determine the decimal numbers which represent the following binary numbers:

1001011_2: $\mathbf{1 \times 2^6 + 0 \times 2^5 + 0 \times 2^4 + 1 \times 2^3 + 0 \times 2^2 + 1 \times 2^1 + 1 \times 2^0 = 75_{10}}$

110001_2: $\mathbf{1 \times 2^5 + 1 \times 2^4 + 0 \times 2^3 + 0 \times 2^2 + 0 \times 2^1 + 1 \times 2^0 = 49_{10}}$

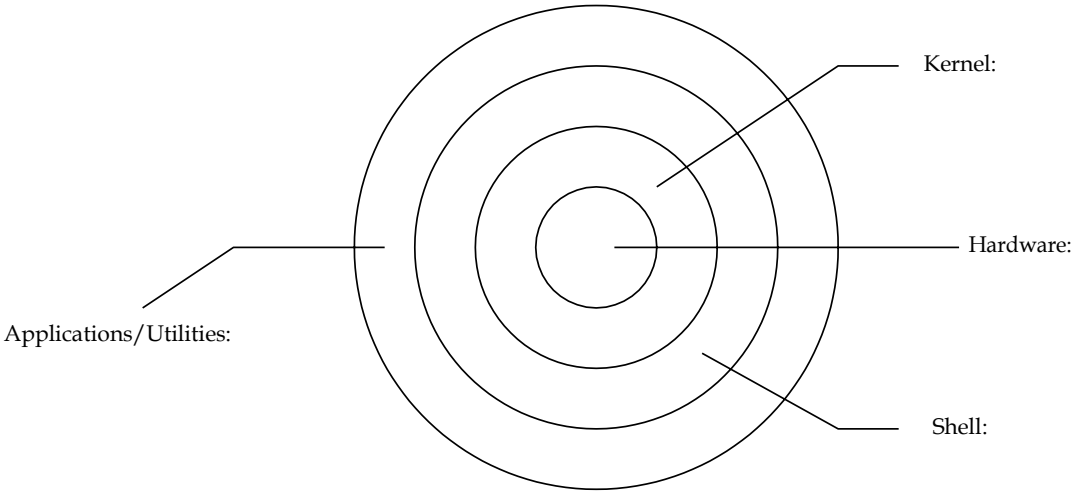
10101110_2: $\mathbf{1 \times 2^7 + 0 \times 2^6 + 1 \times 2^5 + 0 \times 2^4 + 1 \times 2^3 + 1 \times 2^2 + 1 \times 2^1 + 0 \times 2^0 = 174_{10}}$

10_2: $\mathbf{1 \times 2^1 + 0 \times 2^0 = 2_{10}}$

Show all work for credit.

2: Unix environment (20 pts)

Below is a diagram of the Unix environment. In your own words please do the following: list the three essential pieces of hardware on a computer (5pts); describe the purpose of the kernel (5pts); describe the purpose of the shell (5pts); give at least three examples of applications or utilities (5pts).



Hardware:

Memory Cell – Individual building block of memory which is able to store a single bit in one of two states: 0 or 1 – off or on.

Persistent Storage – Memory cells that are able to retain their states when power to the cells is cut off. The three most popular forms are Hard Disks, Hard Drives, and Flash Drives.

Temporary Storage – A grouping of memory cells that is identifiable via an indexed memory address. Most popular form is Random Access Memory (RAM).

Central Processing Unit (CPU) – Brain of the computer that operates based on instructions stored in persistent memory. Able to store and access data stored in temporary memory.

Kernel: **The purpose of the Kernel is to orchestrate all operations of the computer. It is at the core of the operating system with its instructions stored in persistent memory.**

Shell: **The purpose of the Shell is to provide the user with an interface to interact with the operating system's services. Either in the form of a command-line interface or graphical user interface (GUI).**

Applications/Utilities: **Visual Studio Code, Google Chrome, File Explorer, etc..**

3: Unix special symbols (20 pts)

Define the special meaning of the following symbols in the Unix terminal when specifying paths to directories or files:

the '~' symbol: **Home Directory**

the '.' symbol: **Current Directory**

the '..' symbol: **Parent Directory**

the '*' symbol: **Character Sequence Wildcard**

4: Unix commands (20 points)

Describe the main purpose of each of the following commands or characters if used on the command-line:

`cat`: **Concatenate and print files**

`mv`: **Move or rename files or directories**

`cp`: **Copy files or directories**

`grep`: **Search text for a string**

`ls`: **List working directory contents**

`pwd`: **Print working directory**

`cd`: **Change working directory**

5: Unix commands (20 pts)

Suppose you are given three files, `file1.txt`, `file2.txt` and `file3.txt`, containing text, shown below using the `cat` command (note that the **$** symbol simply indicates a command prompt, as opposed to command output):

```
$ cat file1
At Bell Laboratories
UNIX systems provide
```

```
$ cat file2
more timesharing ports
```

```
$ cat file3
than all other systems
```

Suppose now that you execute the following command in your terminal:

```
$ cat file2 file3 > file1
```

Please write the expected output of the following command:

```
$ cat file1
```

more timesharing ports than all other systems

Use the `touch` command to make `file1.txt`, `file2.txt` and `file3.txt`. You may add the above sentences using vim or by opening the `.txt` files with a text editor. Check your work on your machine!