**CIS 350 – INFRASTRUCTURE TECHNOLOGIES**

**HOMEWORK #5, PART I (Chapters 9, 10 & 11) – 40 points**

Student name(s): Regis Wilson and Isaiah Williams

(2 students maximum)

**Part I. Work the following problems in the space provided below. You must show your calculations. Points will be deducted if you do not. (Each exercise 1 through 4 is worth 10 points for the total of 40 points). You must put your answers on these sheets.**

**Exercise 1**

A hard disk contains 15 platters. The data is recorded on both surfaces of each platter. Each surface has 7000 tracks. A track contains 2,000 sectors and each sector stores 2,048 bytes.

1. What is the capacity (expressed in Megabytes and Gigabytes) of one cylinder?
2. What is the capacity (expressed in Megabytes and Gigabytes) of the entire hard disk?

You must show your calculations.

2000 sectors \* 2048 bytes = 4096000 bytes / 1024 = 4000KB / 1024 = 3.90625 MB

15 platters \* 2 surfaces = 30 surfaces

30 surfaces \* 3.90625 MB = **117.1875 MB = 0.1144 GB**

7000 tracks \* 117.1875 MB = **820312.5 MB =801.0864 GB**

**Exercise 2**

The hard disk from Exercise 1 above has the average seek time of 7 milliseconds [ms]. The disk revolves with the speed of 10,200 revolutions per minute.

1. Compute the average rotational delay (latency time).
2. Compute the transfer time for 800 sectors.
3. Compute the total disk access time which is the sum of the three times: the average seek time, the average rotational delay (latency time), and the transfer time for 800 sectors.

You must show your calculations. Express all the times in milliseconds [ms].

10200 / 60 = 170 revolutions/sec

½ \* 1/170 = 0.00294 = **2.94ms**

800 / (2000 \* 170) = 0.00235 = **2.35ms**

7ms + 2.94ms +2.35ms = **12.29ms**

**Exercise 3**

A 2000-pixel by 1200-pixel display is generated on a 15-inch diagonal monitor.

1. How many pixels/dots per inch are displayed on this monitor?
2. How many pixels/dots per millimeter [mm] are displayed on this monitor?
3. What is the size of an individual pixel in [mm]?

Note that 1"=25.4 mm. Approach: Use the Pythagoras theorem to calculate the number of pixels on the 15" diagonal of the monitor for a 2000-pixel by 1200-pixel display.

# pixels on diagonal - sqrt(20002+12002 )= 2332.3807 ≈ **2332**

A) Pixels per inch – 2332/15 = **155 ppi**

B) 2332/(15\*25.4mm) = 2332/381 = **6.12 ppmm**

C) 381/2332 = **0.16 mm/pixel**

**Exercise 4**

Assume that a PCI-Express bus consists of 32 lanes. Each lane is capable of a maximum data rate of 250 MB per second. Lanes are allocated to a device 1, 2, 4, 8, 16, or 32 lanes at a time. Assume that the PCI-Express bus is connected to a high definition video card that is supporting a 2000 × 1200 true color (3 bytes per pixel) progressive scan monitor with a refresh rate of 150 frames per second. How many lanes will this video card require to support the monitor at full capability? You must show your calculations.

2000 \* 1200 \* 3 = 7200000 bytes / 1024 = 7031.25 KB / 1024 = 6.866 MB non-motion true color

6.866MB \* 150 frames/sec = 1029.9862 MB motion true color

The monitor will use 1029.9862 MB / 250 MB/sec max per lane = **4.1199 lanes, which means 8 lanes will be required for use**, since lanes are allocated by the system of 2, 4, 8, 16, 32, 64, and so on at a time.