Solutions to Homework #4

Chapter 2

Problem 17:

CPU has data transfer rate of $200 \times 10^6$ bus cycles/sec. Disk transfer rate is $40 \times 10^6\left(\frac{160\text{Mbytes/sec}}{4\text{ bytes/word}}\right)$ bus cycles/sec. Thus the disk will be responsible $\frac{1}{5}$th of CPU load.

Problem 19:

Cylinder is read completely in 5 full rotations. To read 9999 cylinders, it will take 49,995 rotations. For the last cycle, 4 rotations will be enough because no seek is needed for this last cylinder. So total of 49,999 rotations are necessary. Now each rotation takes 10ms. So, 49,999 rotations will take 499.99 sec.

Problem 23:

Each frame contains 345,600 (720*480) pixels or 1.0368Mbytes of information. With 30f/s, the rate/sec of 31.1Mbytes/sec. For 133 minutes, the number corresponds to 248.2Gbytes. The disk capacity is about 3.5GB. Therefore, we need compression factor of approximately 66.

Problem 27:

The display must draw 0.144Gpixels/sec (1600*1200*75). So each pixel time is just below 7ns.

Problem 31:

Data rate of 12MHz cable with QAM-64 is 72MHz. If nf computers are sharing the bandwidth, each computer will have access to $72/nf$ Mbps. Therefore, cable user will get faster service of $72/nf>2$. Ultimately, if there are less than 36 computers, cable can provide faster service, otherwise ADSL.

Problem 33:

The uncompressed picture size is 48Mbytes. With compression factor of 5, it is 3.6Mbytes. Thus in 1GB flash memory card, we can store 111 pictures with 0.152Mbytes memory left over.
Chapter 3

Problem 1:

The order can be interpreted as

Hamburger OR (hotdog AND French fries) or as

(Hamburger OR hotdog) AND French fries.

That leads to A, D and E is possible interpretations.

Problem 3:

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<th>Y</th>
<th>X AND Y</th>
<th>X AND (NOT Y)</th>
<th>(X AND Y) OR (X AND (NOT Y))</th>
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