Chapter 3

Q.1 Suppose the size of an uncompressed text file is 1 megabyte.

a. How long does it take to download the file over a 32 kilobit/second modem?

T_{32k} = 8 (1024) (1024) / 32000 = 262.144 seconds

b. How long does it take to take to download the file over a 1 megabit/second modem?

T_{1M} = 8 (1024) (1024) bits / $1x10^6$ bits/sec = 8.38 seconds

c. Suppose data compression is applied to the text file. How much do the transmission times in parts (a) and (b) change?

If we assume a maximum compression ratio of 1:6, then we have the following times for the 32 kilobit and 1 megabit lines respectively:
T_{32k} = 8 (1024) (1024) / (32000 x 6) = 43.69 sec
T_{1M} = 8 (1024) (1024) / ($1x10^6$ x 6) = 1.4 sec

Q.2 A scanner has a resolution of 600 x 600 pixels/square inch. How many bits are produced by an 8-inch x 10-inch image if scanning uses 8 bits/pixel? 24 bits/pixel?

Solution:

The number of pixels is 600x600x8x10 = $28.8x10^6$ pixels per picture.

With 8 bits/pixel representation, we have: $28.8x10^6$ x 8 = 230.4 Mbits per picture.

With 24 bits/pixel representation, we have: $28.8x10^6$ x 24 = 691.2 Mbits per picture.

Q.4 Explain the difference between facsimile, GIF, and JPEG coding. Give an example of an image that is appropriate to each of these three methods.

Solution:

Facsimile scans a black-and-white image into rows of black and white dots, which are then compressed. The scanning process introduces distortion in the sense that the scanned image is not the same as the original image.

GIF takes image data, in binary form, and applies a lossless data compression scheme.

JPEG involves scanning an image and applying a lossy compression scheme that is designed so that the distortion is not visible.