Assignment 2

Exercise 1. Find the data sheet or specification of a magnetic or solid state (SSD) hard drive from any manufacturer. Do:

a) Based on the manufacturer information, obtain the total size of the drive in bytes (B).

b) Calculate the the size of the drive in true GB (IS units).

c) Calculate the size of the drive in GiB (IEC binary units).

Exercise 2. Convert the following numbers to base 10.

a) $100.111010_{(2}$; b) $50_{(8}$; c) $101.1_{(2}$; d) $198F_{(16}$

Exercise 3. Convert the decimal number 138.7 to bases 2, 8 and 16. Use the base 2 representation to convert directly to bases 8 and 16.

Exercise 4. (Optional) Convert the following numbers to the target base in an exact way.

a) $7,\overline{3}_{(10}$, $12,\overline{5}_{(10}$ y $2,\overline{9}_{(10}$ to base 2.

b) $110,\overline{1001}_{(2}$ y $10,0\overline{110}_{(2}$ to base 10.

Exercise 5. Interpret the meaning of the binary word “10110101” in the following digital encodings:

a) Natural binary number.

b) Natural BCD encoding.

c) Excess-3 BCD encoding.

d) ASCII character encoding with leading parity bit.

e) ISO-8859-15 (Latin 9) character encoding

Exercise 6. Represent the decimal number 8620 in the following encodings:

a) 16-bit natural binary.

b) Natural BCD.

c) 2-out-of-5 BCD encoding.

d) Unicode characters with with a UTF-8 Unicode encoding.

Exercise 7.

a) Calculate the data rate of a CD-quality digital audio recording. Give the result in kb/s.

b) Calculate the size in MiB without compression of a CD-quality digital audio recording 3 minutes and 52 seconds long. Use the data rate calculated above.

NOTE: CD-quality means 44.1kHz sample rate, 16 bit sample resolution and 2 channels.

Exercise 8. Calculate the size in MiB of a raw image of 1920x1080 pixel resolution and 32 bits color depth.

Exercise 9. (Optional) Take any stereo digital audio recording about 4 minutes long (e.g. a song in mp3 format).

a) Calculate an approximation to the data rate of the audio data by using the size of the file and the duration of the audio clip. Express the result in kb/s. Compare to the data rate of a standard CD-quality digital audio recording.

b) Convert the audio file to CD-quality uncompressed PCM format. You may use a software like “Audacity” and use a WAV file format for the result. Take note of the size of the resulting file.

c) Calculate the expected uncompressed size of the previous audio like in exercise 7. Compare to the size of the file and comment any differences.