

**Foundations of Multimedia technologies Midterm exam. 2018.04.17.**

Please give the answers in the blank space below the questions and on further additional blank papers *with indicating the name, Neptun ID and the no. of the given question!*

**Total: 40 points** 0-20 points: failure (1), 20-25 points: poor (2), 25-30 points: satisfactory (3), 30-35 points: good (4), 35-40 points: excellent (5)

Name: \_\_\_\_\_  
Neptun ID: \_\_\_\_\_

1. **5 point** What is the definition of luminance, hue and saturation perceptual parameters in a television color measure system (supposing we know the  $R, G, B$  coordinates of a given color point, and the required transform matrix is given in the next question)?
2. **5 point** Illustrate the Gamma-correction process with a block diagram! How are luma and chroma components calculated in the HDTV system, where the RGB transform matrix is given as

$$\begin{bmatrix} X \\ Y \\ Z \end{bmatrix} = \begin{bmatrix} 0.4124 & 0.3576 & 0.1805 \\ 0.2126 & 0.7152 & 0.0722 \\ 0.0193 & 0.1192 & 0.9505 \end{bmatrix} \begin{bmatrix} R \\ G \\ B \end{bmatrix}_{ITU-709}$$

and the Gamma-correction curve reads

$$V' = \begin{cases} 4.500V & V < 0.018 \\ 1.099V^{0.45} - 0.099 & V \geq 0.018. \end{cases}$$

3. **10 point** What is chroma-subsampling, why was it introduced and what does the chroma subsampling scheme notation indicate? Describe the chroma subsampling schemes, used in the SD studio standard (ITU-601), in MPEG-1 and in MPEG-2!
4. **5 point** What is the common SD sampling frequency in European and American systems? What considerations lead to this choice?
5. **5 point** Calculate the optimal HDTV display size in case of a screen with 1080 lines, observed from a viewing distance of 3 meters!
6. **10 point** Draw the schematics (block-diagram) of a forward adaptive psychoacoustic encoder! Which are its benefits and which is its main drawback? Which widely used audio encoder applies this approach?