OHJ-2700/OHJ-2706 Tietokonegrafiikka (Computer Graphics 6op)
Examination Questions, Artur Lugmayr

!!! PLEASE ANSER ALL THE QUESTIONS IN ENGLISH !!!

1. True/False questions: please answer if the following statements are either true or false, and give the reason why.
   - When a 2D point p is given, and a translation (T1) and a rotation (R) and another translation (T2) is applied, the order of applying transformations to the 2D point does not matter (true/false)
   - Ray tracing is a technique for intersection tests to find out, which light beams cross each other (true/false)
   - The Bresenham line algorithm is used to calculate a parallel projection (true/false)

2. Transformations in homogeneous coordinates
   - give the matrix and the explanation for rotation, scaling, and translation in 3D
   - give the matrix and the explanation for rotation, scaling, and translation in 2D

3. Color representation
   - What is gamma correction? Why is it needed and how is it applied? What is its practical application?
   - What represents the alpha channel? How can it be used and why is it needed? What is the practical application of the alpha channel?
   - Explain the HSV color model by example and compare it to other possible color models.

4. Spatial Data Containers
   - What are spatial data containers? For which purposes are they used?
   - Explain one spatial container in further detail (e.g. PR quadtree, fixed portioning of space, bounding box hierarchies, ...)

5. Describe the stages of the 3D graphics pipeline. What are the tasks, functions, and steps in each part of the graphics pipeline? What are the different spaces?

6. Lightening and shading of surfaces - what is the idea behind the following techniques? Please also draw a graphics to underline the techniques:
   - Fading lightening
   - Phong shading
   - Ambient lightening

7. Your customer informed you, that he is interested in the implementation of a 3D installation for an exhibition. Children should be able to interact and play 3D games on a wall. Your task is to conceptualize the realization of this software package. What is needed in terms of modeling, rendering, game engine, or input devices? What is the difference to a PC based system? *The goal of this question is to apply the knowledge acquired within the course. It is more a question of understanding, and any topic that has been presented is adequate to answer this question if related to the software package. A few hints: rendering indoor scenes, graphics pipeline, spatial containers, shading, lightening models, stencil buffer, etc. How can these techniques be applied?*