Exam – Computer Graphics

13 January 2011, 14-19

1 (a) What is the most efficient way to calculate the inverse of a rotation matrix? *(0.3)*
(b) What is the most important advantage of representing transforms as matrices? *(0.4*)
(c) How is this advantage utilized in the design of a renderer*? (0.3)*

2 (a) Explain how *rasterization* of a triangle is done. *(0.5)*
(b) Explain how *shading* of a rasterized triangle is done. *(0.5)*

3 (a) What is *perspective correct interpolation*?. *(0.4)*
(b) What is *light mapping* and what is it useful for. *(0.3)*
(b) What is *image based lighting*. *(0.3)*

4 (a) What is *bump mapping* and what is it used for? *(0.4)*
(b) Which data must the mesh provide in order to apply it? (*0.3*)
(c) Describe the algorithm for bump mapping. (*0.3*)

5 Compute ***T****(1,1,1) where ***T*** is defined as the matrix product

$$\boldsymbol{T = M1*R1*S*M2*R2}$$

where each term is the matrix for a two-dimensional transform in homogenous coordinates as given below:

M1:	translation by the vector (-1,-1)
R1:	rotation 45 degrees anti-clockwise
S:	scaling by the factor 2
M2:	translation by the vector (1,1)
R2:	rotation 90 degrees clockwise

6 (a) State the per-pixel and per-vertex expressions for the diffuse reflection according to Phong's reflection model in a point with barycentric coordinates (b_0, b_1, b_2). The vertices of the triangle have normals ($\boldsymbol{n}_0$, $\boldsymbol{n}_1$, $\boldsymbol{n}_2$) the light comes from a directional light source such that the light vector is **L** and the light intensity at the triangle is *I*. (*0.8*).

(b) In Phong's reflection model there is a so called *ambient* term. What is it and what is its purpose? *(0.2*)

THE END!