CS 465 Prelim 2 (Fall 2007, Prof. James)

Monday 12 November 2007—50 minutes

The exam contains *6 questions* worth a total of *100 points.*

Explain your reasoning in words and equations for full marks.

Problem 1: Compositing (15 pts)

Explain (in words and equations) what is meant by *premultiplied alpha*, and illustrate **two benefits** of using it.

Problem 2: Hidden surface elimination (15 pts)

What are **two pros** and **two cons** of the *Z-Buffer algorithm* for hidden surface elimination?

Problem 3: Ray intersection (15 pts)

What are **four ways** to *accelerate ray-triangle intersection calculations* when rendering large triangle meshes?

Problem 4: Distribution ray tracing (15 pts)

Propose a method for ray tracing a *glossy reflection.*

Problem 5: Beer's Law (25 pts)

a) Apply Beer's law (twice) to provide an expression for the apparent color of a *white* horizontal emissive surface (i.e., a light) viewed through a horizontal layer of glass (of thickness h_{glass}) atop a horizontal layer of tinted water (of thickness h_{water}). Assume that the view ray is *perpendicular* to the horizontal surfaces, so that the total in-liquid path length is $(h_{glass} + h_{water})$.

b) Does the apparent color depend on the particular *vertical order* of glass/water layers? Is this also true for non-normal incident view directions (i.e., $\theta \neq 0$ in Snell's law)?

Problem 6: Appearance modeling (15 pts)

What are **three** attractive features of procedural *Perlin noise* over image-based texture mapping?