CS4731- A Term '01 - Final Exam

Name and Login ID:

Please answer 6 of the first 7 questions, plus number 8. Cross out the question you do not wish to have graded. Read questions carefully before answering. Do not hesitate to ask for clarification. Show all work. Partial credits are given, so do not leave anything blank! Use the back of the pages or extra paper as needed. Good luck!

1. (16 pts) Describe three *distinct* ways to apply texture to a surface, using the surface of the moon as a focus for discussion.

2. (16 pts) Give brief definitions for the following terms as they are used in the field of graphics:

- Spatial Enumeration
- HSV Color Space
- Phong Reflectivity Model
- Phong Shading

3. (16 pts) As promised, give two equations of a plane that go through the points $(-2., 2., 2.)$, $(4., 3., 2.)$, and $(-5., 1., 5.)$.

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4. (16 pts) Discuss three stages of the graphics pipeline that are simplified by reducing the object models to triangles. Why was it easier in each case to deal with triangles rather than arbitrary polygons?

5. (16 pts) In clipping a *convex quadrilateral* against a rectangular clipping region, we can end up with polygons of many different shapes. The minimum non-empty polygon will have 3 edges after clipping. What is the maximum number of edges $E_{max}$ in the resulting clipped polygon? Show examples of clipping a convex quadrilateral that results in polygons having all possible number of edges between 3 and $E_{max}$.

6. (16 pts) What happens to objects that lie behind the camera if they are not clipped prior to the perspective projection stage? How would moving the object from $z = -10.$ to $z = -20.$ affect it? Use pictures or equations to verify your answers.

7. (16 pts) Determine the Bezier blending functions for $4^{th}$ order polynomial, i.e., one that has 5 control points. Sketch each function and label the maximum and minimum values. As a reminder, the Bezier curve is defined as follows:

$p(t) = \sum_{k=0}^{k=n} p_k * B_{k,n,t}$

$B_{k,n,t} = C_{n,k} * t^k * (1-t)^{n-k}$

$C_{n,k} = \frac{n!}{k! * (n-k)!}$

8. (4 pts) Suggest a theme for next year's objects to be modeled.