

CS354: Computer Graphics

Practice Questions for Final

Please write your answers ON THESE SHEETS. Attach extra sheets if necessary. The size of the space indicates roughly the size of the answer we are expecting.

SHOW YOUR WORK; especially for calculations, you might make an arithmetic mistake but get partial credit for setting up the problem correctly.

1. (3 points) **TRUE** or **FALSE**: The OpenGL command *glPerspective* always produces a projection matrix which maps the origin to a point at infinity in clip-coordinates.
2. (3 points) **TRUE** or **FALSE**: For any values of the parameters u, v between zero and one, the blending functions for a quadric Bezier patch add up to one; that is,

$$\sum_{i=1}^3 \sum_{j=1}^3 B_i(u)B_j(v) = 1$$

3. (6 points) List the following operations in the order in which they are performed in the graphics pipeline:
clipping, vertex lighting calculations, texture image lookup, modeling transformations, projection, viewport transformation to pixel coordinates, backface culling.
4. (5 points) The following projection matrix is applied to the 3D vertex (4.0, 3.0, 2.0). To what two-dimensional point is the vertex projected?

$$\begin{bmatrix} 1.0 & 0.0 & 0.0 & 0.0 \\ 0.0 & 1.0 & 0.0 & 0.0 \\ 0.0 & 0.0 & 1.0 & 2.0 \\ 0.0 & 0.0 & 1.0 & 0.0 \end{bmatrix}$$

5. (5 pts) What camera motion is accomplished by the following two lines? Describe the motion of the camera.

```
glTranslate3f(3.0,0.0,0.0);  
glRotatef(90,0.0,3.0,0.0);
```

6. (5 pts) Here is an OpenGL material specification:

```
GLfloat amb [] = {0.3,0.3,0.1,1.0}
glMaterialf(GL_FRONT, GL_AMBIENT, amb);
GLfloat diff [] = {0.3,0.3,0.1,1.0}
glMaterialf(GL_FRONT, GL_DIFFUSE, diff);
GLfloat spec [] = {0.0,0.0,0.0,1.0}
glMaterialf(GL_FRONT, GL_SPECULAR, spec);
```

Circle the best statement; just pick one. *

- a) This would be a good material specification for a shiny yellow taxi cab.
- b) This would be a good material specification for a brown tree trunk.
- c) This would be a good material specification for a grayish-blue stone wall.
- d) This would be a good material specification for a reddish-green brick house.
- e) This is a bad material specification; there will be no diffuse lighting effect since the ambient and diffuse colors are the same.
- f) This is a bad material specification; the specular highlights will be darker than the rest of the surface instead of brighter.

7. (10 points) A parametric surface is defined as the set of points $(X(u, v), Y(u, v), Z(u, v))$ where

$$\begin{aligned}X(u, v) &= u \\Y(u, v) &= v \\Z(u, v) &= \sin(v)\end{aligned}$$

Give a formula for the normal vector as a function of the parameter values (u, v) .