
Course code & title	: Topics for Computer Graphics
Session	: Semester B 2020/21 Quiz 2
Time allowed	: 65 minutes
Instructions	: Answers should be hand written and submitted as a pdf.

Copy the following on the first page of your test answer sheet.

"I pledge that the answers in this examination are my own and that I will not seek or obtain an unfair advantage in producing these answers. Specifically,

1. I will not plagiarize or copy the work of another person during the examination;
2. I will not communicate with another student taking the examination; and
3. I will use only approved devices (e.g., calculator) and device models.
4. I understand that any act of academic dishonesty is a violation of the honor code.

Name _____ SID _____ Signature _____

Qn 1 (25 marks)

- a) If it is desired to simulate accelerate-then-decelerate motion using an empirical function, what is the form of the function and the angle range?
- b) α is the angle of a part in your object. You wish to change α from 40° to 160° in an accelerate-then-decelerate motion in 3 seconds. Write the corresponding *glutIdle* function. Use the empirical function in a) to simulate the motion.

Qn 2 (25 marks)

- a) Draw a green ground plane whose 4 corners are $(-150, -150, 2)$, $(150, -150, 2)$, $(150, 150, 2)$ and $(-150, 150, 2)$. The ground plane has equation $Z = 2$. Write the function *ground_plane* () which draws the plane.
- b) Draw a blue cube of length 10 sitting on the ground plane with center $(0, 0, 7)$. Write the function *cube* () which draws the cube.
- c) Write OpenGL code to draw the ground plane, the cube and its shadow on the ground plane. The point light source is at $(10, 20, 30)$. Also, show the derivation of the projection matrix.

Qn 3 (25 marks)

- a) In Qn 2, if the light source is changed to a lighting direction $(-1, 1, 2\sqrt{2})$, what should be the 4×4 projection matrix.
- b) Name the type of the projection in a).
- c) List two limitations for the shadow generated in Qn 2.

Assignment Project Exam Help

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(Qn 4 on the next page)

Qn 4 (25 marks)

An OpenGL scene has the following settings for shading calculations:

```
glEnable (GL_LIGHTING);  
GLdouble V1 [ ] = {0.0, -1.0/sqrt(2), 1.0/sqrt(2), 0.0}  
GLdouble V2 [ ] = {0.2, 0.2, 0.2, 1.0}  
GLdouble V3 [ ] = {0.8, 0.8, 0.8, 1.0}  
GLdouble V4 [ ] = {0.8, 0.8, 0.8, 1.0}
```

```
glLightfv (GL_LIGHT1, GL_POSITION, V1);  
glEnable (GL_LIGHT1);  
glLightfv (GL_LIGHT1, GL_AMBIENT, V2);  
glLightfv (GL_LIGHT1, GL_DIFFUSE, V3);  
glLightfv (GL_LIGHT1, GL_SPECULAR, V4);
```

```
gluLookAt (100, 100, 100, 0, 0, 0, 0, 0, 1, 0);
```

A plane $Z = 0$ has the following material characteristics:

```
GLdouble V5 [ ] = {0.1, 0.1, 0.1, 1.0}  
GLdouble V6 [ ] = {0  
GLdouble V7 [ ] = {0  
glMaterialfv (GL_FRONT_AND_BACK, GL_DIFFUSE, V6);  
glMaterialfv (GL_FRONT_AND_BACK, GL_SPECULAR, V7);  
glMaterialf (GL_FRONT_AND_BACK, GL_SHININESS, 100.0);
```

- Compute the result of back face detection at the point of the plane the camera is pointing at.
- Derive the intensity at the point of the plane the camera is pointing at.

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