

Milwaukee School of Engineering
Electrical Engineering and Computer Science Department

CS421 – Midterm

Thursday 23 January 2003

Allowed Materials: 8½" × 11" Note Sheet, 1 Side

Name: _____

Problem 1: (40 Points) _____

Problem 2: (30 Points) _____

Problem 3: (30 Points) _____

Total: (100 Points) _____

Use this space for additional work, if needed.

Problem 1 – Short Answer (40 Points – 5 points each)

A. OpenGL is state-based. What does this mean?

B. An OpenGL function name ends in “3fv”. What does this mean?

C. What are two important differences between OpenGL line loops and polygons?

D. Why can you “get away” with not moving the model away from the camera with orthographic viewing (`glOrtho(...)`) but not with perspective viewing (`gluPerspective(...)`)?

E. What is a “basis transformation” used for?

F. Information about polygon facing is provided to OpenGL by both `glFrontFace(...)` and `glNormal3*(...)`. Describe at least one use of each type of facing data.

G. Most people can easily see flicker below about 50 refreshes per second. An NTSC TV signal has 30 frames per second. $30 < 50$, so why can most people not see flicker while watching TV?

H. What are two methods of preventing faces that are not visible in OpenGL models from being drawn on the screen?

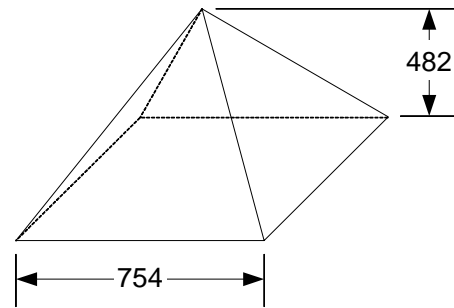
Problem 2 – Hierarchical Representations (30 Points)

A large assembly consisting of various types of LEGO blocks is to be modeled using a hierarchical representation. Depending upon the type of model, either a tree or a directed acyclic graph representation (of LEGO pieces) may be appropriate. State and justify conditions under which each approach should be used.

Problem 3 – Solid Rendering and Normals (30 Points)

A solid pyramid has a base width of 754 units and a height of 482 units as shown in the diagram.

Write the OpenGL calls that will draw this solid pyramid and properly establish the outward surface normal for each face. Orient the pyramid in any way that you find convenient as long as the sizes, positions, and normal orientations are consistent.



Extra Credit (5 Points): Add culling support to your geometry.