

5. (a) How can a Z-buffer be used to correctly deal with hidden surfaces? What instructions are required to use depth buffering in OpenGL? [3]
- (b) How can multiple transparent and opaque surfaces be properly blended using Z-buffers and alpha blending? [5]
- (c) What is back-face culling and how is it implemented? [4]
- (d) How can ground-plane shadows be generated of a polygon mesh consisting of 3D points  $\mathbf{P}_i$ , for a distant light source at world coordinate  $\mathbf{L}$ , assuming that the ground plane is at  $z = 0$ ? [6]
- (e) What are shadow volumes and how can they be used together with stencil buffers to produce realtime shadows? [7]