

1. (a) Explain how the human visual system's capabilities are exploited by computer graphics. [4]
- (b) What are the standard components of a graphics system? Illustrate with a diagram the main stages of a 3D viewing pipeline. [7]
- (c) In OpenGL, what are matrix stacks? What do the following statements each do and which matrix stack would you normally use them on?
- i. `gluOrtho2D(0, 1000, 0, 1000);`
- ii. `glTranslatei(500, 500, 0);`
`glScalef(2.0f, 2.0f, 1.0f);`
- [7]
- (d) Show how a rotation of θ about an arbitrary axis, $(a, b, c)^T$, through the origin, can be achieved by suitable rotations about the principal axes of θ_x and θ_y and θ_z respectively. Calculate coefficients of rotation matrices $R_x(\theta_x)$ and $R_y(\theta_y)$ and give a set of OpenGL statements which will perform $R(\theta)$, if the angles are given in degrees. [7]