

## 2005 Paper 13 Question 6

### Computer Graphics and Image Processing

- (a) In ray tracing, once we have determined where a ray strikes an object, the illumination at the intersection point can be calculated using the formula:

$$I = I_a k_a + \sum_i I_i k_d (\mathbf{L}_i \cdot \mathbf{N}) + \sum_i I_i k_s (\mathbf{R}_i \cdot \mathbf{V})^n.$$

Explain what real effect each of the three terms is trying to model, how accurately it models the real effect, and explain what each of the following symbols means, within the context of this formula:

$$I, I_a, i, I_i, k_a, k_d, k_s, \mathbf{L}_i, \mathbf{N}, \mathbf{R}_i, \mathbf{V}, n.$$

[12 marks]

- (b) Compare and contrast the ray tracing and  $z$ -buffer algorithms. [8 marks]