

2004 Paper 9 Question 6

Advanced Graphics

- (a) Describe an algorithm to find the intersection point between an arbitrary ray and an arbitrary plane. [5 marks]
- (b) Explain how a plane can be used as a Computational Solid Geometry (CSG) primitive. [2 marks]
- (c) List the three binary operations used in CSG. Explain how a CSG object can be represented as a binary tree. Describe an algorithm to find the first intersection point between a ray and an arbitrary CSG object. Assume that there are already algorithms which you can use to find the intersection points between the ray and each type of CSG primitive. Ensure that you state any assumptions you make about the information provided to you by these ray-primitive intersection algorithms. [8 marks]
- (d) Derive the NURBS basis function $N_{4,4}$ for the knot vector $[1, 2, 3, 4, 5, 5, 5, 6, 7, 8, 9, 10]$. [5 marks]