COMPUTER SCIENCE TRIPOS Part IB 75%, Part II 50% – 2020 – Paper 7

6 Further Graphics (pb355)

- (a) Consider the b-spline curve P(t) with knot vector [0, 1, 2, 3, 3, 3] and k = 3.
 - (i) In a single sentence, explain the effect on P(t) of repeating a knot value k times. [1 mark]
 - (*ii*) State the equations that define P(t). [3 marks]
 - (*iii*) State the equation and sketch the graph for each of the three quadratic basis functions $N_{i,3}(t)$ of P(t). [8 marks]
 - (*iv*) Plot the path of P(t) for control points $P_0 = (0,0), P_1 = (4,0), P_2 = (4,4).$ [4 marks]
- (b) Consider an embedded closed manifold surface with 48 vertices, 48 faces, and 100 edges.
 - (i) What is the genus of this surface, and what is the formula to find it? [2 marks]
 - (*ii*) What is the total angle deficit of this surface, and what is the formula to find it? [2 marks]