Advanced Graphics and HCI

(a) For a given order, \( k \), there is only one basis function for uniform B-splines. Every control point uses a shifted version of that one basis function. How many different basis functions are there for open-uniform B-splines of order \( k \) with \( n + 1 \) control points, where \( n \geq 2k - 3 \)? [6 marks]

(b) Explain what is different in the cases where \( n < 2k - 3 \) compared with the cases where \( n \geq 2k - 3 \). [3 marks]

(c) Sketch the different basis functions for \( k = 2 \) and \( k = 3 \) (when \( n \geq 2k - 3 \)). [4 marks]

(d) Show that the open-uniform B-spline with \( k = 3 \) and knot vector \([000111]\) is equivalent to the quadratic Bezier curve. [7 marks]