Computer Graphics and Image Processing

(a) Pick two of these three colour spaces: Lab, CMYK, HLS. For each of your chosen two colour spaces, explain what each of the dimensions represents and for what uses the colour space is best suited. [6 marks]

(b) Describe a run-length encoding method for greyscale images. [6 marks]

(c) The following is a Bezier curve drawing algorithm which includes bounding box clipping. Provide pseudocode for the functions InBoundingRect and DrawUnclippedBezier.

function DrawClippedBezier(float x1, y1, x2, y2, x3, y3, x4, y4)
begin
  if NearlyStraight(x1, y1, x2, y2, x3, y3, x4, y4)
  then DrawClippedLine(x1, y1, x4, y4)
  else begin
    r = InBoundingRect(x1, y1, x2, y2, x3, y3, x4, y4) ;
    if(r=0) then DrawUnclippedBezier(x1, y1, x2, y2, x3, y3, x4, y4);
    if(r=1) then begin
      DrawClippedBezier(x1,y1, (x1+x2)/2,(y1+y2)/2,
      (x1+2*x2+x3)/4,(y1+2*y2+y3)/4,
      (x1+3*x2+3*x3+x4)/8,(y1+3*y2+3*y3+y4)/8);
      DrawClippedBezier((x1+3*x2+3*x3+x4)/8,(y1+3*y2+3*y3+y4)/8,
      (x2+2*x3+x4)/4,(y2+2*y3+y4)/4,(x3+x4)/2,(y3+y4)/2,x4,y4);
      end;
    end;
  end;
end;

Notes: The bounding rectangle is defined by the four (global) floating point variables left, right, top, and bottom. You may assume that we have two line drawing functions available DrawClippedLine and DrawUnclippedLine. The former draws a line having first clipped it to the bounding rectangle, the latter just draws a line without regard for the bounding rectangle (which should therefore only be used if the programmer has assured him- or herself that the line will not extend beyond the bounding rectangle). The two functions DrawClippedBezier and DrawUnclippedBezier do the same for Bezier curves. The function NearlyStraight returns true if the Bezier curve lies within half a pixel of a straight line from its first to its last point along its entire length, otherwise it returns false. [8 marks]