4 Introduction to Graphics (rmk38)

(a) What are typical applications of RGB, HLS, and CIE L*a*b* colour spaces? Compare and contrast these spaces. [7 marks]

(b) Explain the purpose of two-step transformation from linear, scene-referred colour values to the display encoded values. [7 marks]

(c) An image is given in a linear ITU-R 2020 RGB colour space (display referred). Write down a sequence of equations to transform pixel values in that image into a gamma-corrected ITU-R 709 RGB colour space. Use the symbol $M_{2020,XYZ}$ to denote the $3 \times 3$ matrix for transforming from ITU-R 2020 to the CIE XYZ colour space; and the symbol $M_{709,XYZ}$ to denote the $3 \times 3$ matrix for transforming from ITU-R 709 to the CIE XYZ colour space. Use a standard gamma formula with $\gamma = 2.2$. [6 marks]