**MAS364 Homework 2** **Department:** **ID:** **Name:**

This homework score is the double of the other homework scores.

**1** Textbook Exercise 4.3

5 Points

**2** Textbook Exercise 9.3

5 Points

**3** Using the given $60 \times 60$ matrix **Check**, do the following.

5 Points (1) Using matlab function **imshow**, show the image of matrix **Check**.

(2) Using **Check**$= \sum_{i=1}^{60} \sigma_i u_i v_i^*$, explain how to save **Check** with smallest amount of data without loss of image. Calculate smallest amount of data needed by your method.

(3) Using matlab function **imshow**, confirm your answer for problem (2) can produce original image without loss of image.

**4** (1) Find the images of rank-25, 50, and 100 approximations of the given image

5points (kaist.jpg).

(2) Find the relative error of each approximation using the Frobenius norm (relative error means that the error calculated by the Frobenius norm is divided by the maximal possible error.

(3) Find the compression rate (the ratio of the amount of data used for the approximation and the amount of the original image data) for each approximation. The amount of the original image data means the number of entries in the original image matrix (i.e. $row \times columns$)

※ For 4-(2), relative error is

$$\frac{\|X - X_{approx}\|_F}{\|X\|_F}$$

where, $X$ is original matrix and $X_{approx}$ is approximated matrix