**ANKARA UNIVERSITY**
**Computer Engineering**
**COM466B – Digital Image Processing**
**Practical Coursework as Midterm Exam**

In this practical coursework, you will develop the code for several image processing tasks described below. You will be submitting a pdf report in addition to your source code until **May 3, Sunday, 23:59.** The grade for this work constitutes 30% to your course grade.

**Important Note:** There are four tasks below. For each one, you should save the result(s) as an image (images) so that you can put them in your report. DO NOT submit these images as separate files; only include them in your pdf. The report is expected to contain for each task, explanation about how you completed the task (explanation of your source code/algorithm) and the results you obtained.

**Important Note:** You can of course discuss the problems with other students but your code and report MUST be your own work. Plagiarism will NOT be tolerated.

**Preparation** Choose a color image (jpeg, png, etc.) you like for testing the following operations.

1. **[15 points]** Convert the image to a grayscale (monochrome) image using a library function. We will use this grayscale version for the rest of this coursework. If you cannot do this step but want to attempt the following tasks, you can find a grayscale image or do the conversion with other software. However, you will not get points for Task 1 if you don't convert a color image to grayscale with code.

2. **[25 points]** By writing your own function called **resizeToQuarter**, which takes in a grayscale image as input, make the image smaller so that the number of pixels is decreased to 1/4. To do this, you can take the average of every four-pixel square in the input image and use this average as the intensity of one pixel in the new image.

3. **[30 points]** Write a function/method called **mySharpening,** which applies the Laplacian filter given below to its input image. Do not use a library function for the main task here, move the filter over the image by iterating over pixels and apply the filter to a pixel at each iteration yourself. You need to think about how to handle pixels at the edges. Choose one of the solutions we discussed in the course. Once you complete this function, give it your image and view the result.

| -1 | -1 | -1 |
|----|----|----|
| -1 | 9  | -1 |
| -1 | -1 | -1 |

4. **[30 points]** You are given a noisy grayscale image together with this document. Perform noise removal to improve this image. You are free to use library functions and carry out enhancements. You are encouraged to try different techniques and/or use several steps to combine multiple techniques instead of choosing a single method. Try different methods to see which method or combination of methods gives the best result. In your report, mention a method or a combination you tried only if you can show a result (even if it was a bad one). If you are applying multiple methods following each other, show intermediate results.