Question 2

Image Pyramid

I have defined a function named "gaussian_pyramid" that generates a Gaussian pyramid from the input image. The function takes two arguments: the input image and the number of pyramid levels to be generated. The function first appends the input image to a list named "img_pyramid." It then down-samples the image by half in both the x and y directions using the cv2.resize() function and appends the resulting image to the "img_pyramid" list. The process is repeated until the specified number of pyramid levels (5) is reached.

I then call the "gaussian_pyramid" function with the grayscale image and the number of pyramid levels set to 5. The resulting pyramid is stored in a list named "pyramid." The last down-sampled image (32x32) is displayed using the cv2.imshow() function.

Next, the program generates an error image for each level of the pyramid except the first level. The error image is computed by subtracting the down-sampled image at the current level from the up-sampled image of the previous level. The error image is displayed using the cv2.imshow() function and stored in a list named "error_image."

Finally, the program reconstructs the original image using the last down-sampled image (32x32) and the error images. The reconstruction process starts by up-sampling the 32x32 image to the next level and adding the corresponding error image. The process is repeated until the original image is reconstructed. The reconstructed images are displayed using the cv2.imshow() function.
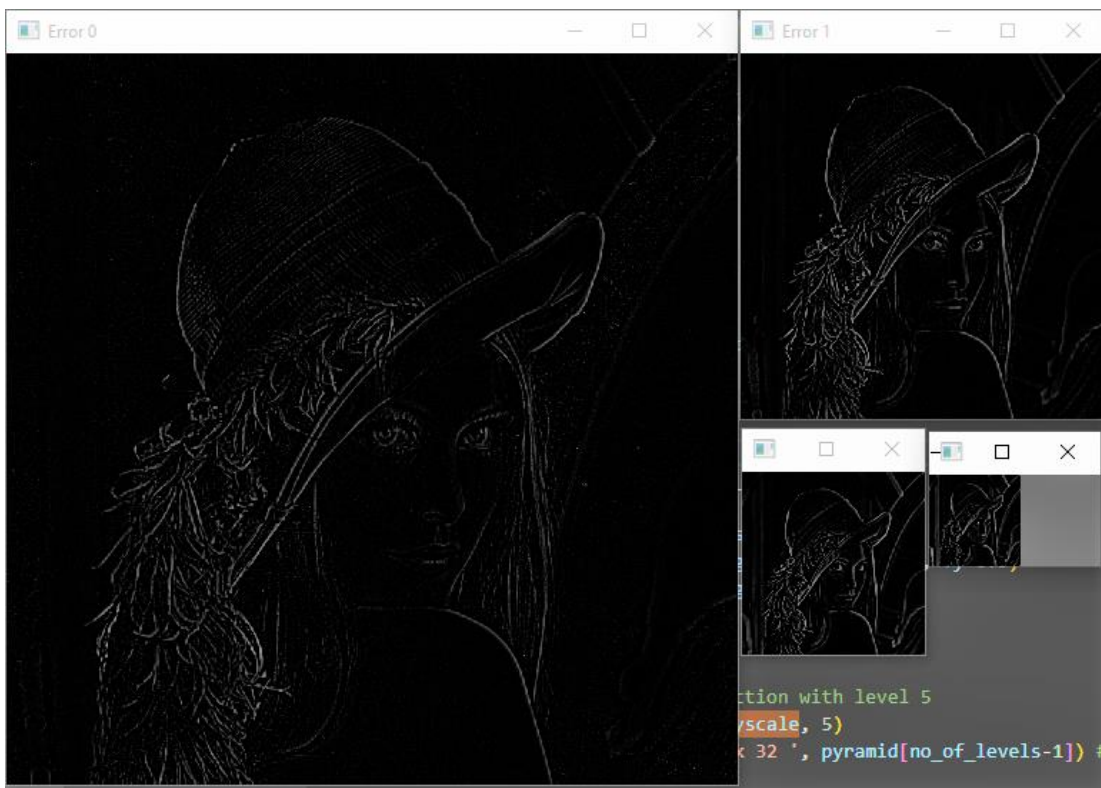
In summary, the provided code implements a simple image compression and decompression technique using Gaussian pyramid. The program down-samples the input image to create a pyramid of images with reduced spatial resolution. The down-sampling introduces errors in the image, which are stored as error images.

Pyramid creation –

Downsampled to 32 x 32

The image above are the error images produced. The snip has been enhanced for visibility.

Image Reconstruction –

Reconstructed images from error images and down-sampled images