Roll No.: _____

Attend all questions

PART-A (5x2=10 marks)

1. Apply Discrete Fourier Transform, for the following image matrix:
$$\begin{bmatrix} 0.5 & 1.85 & 2.25 & 1.25 \\ 0.5 & 0.35 & 4.35 & 3.45 \\ 0.5 & 1.06 & 6.45 & 6.75 \\ 0.5 & 1.45 & 4.35 & 7.32 \end{bmatrix}$$

2. Perform Histogram Equalization for the following data points:

Pixel Intensities	10	20	30	40	50	60	70	80	90	100
No. of pixels	2	4	4	3	3	2	4	2	2	2

PART-B (5x2=10 marks)

1. One evening, a photography student was helping his grandmother digitize old photo albums. After scanning the images, he noticed that the files were taking up too much space on her computer. Remembering his image processing lessons, he decided to compress the images using a simple technique. The original photo size was 8 MB, and after compression, the file size reduced to 2 MB. He wanted to tell his grandmother how efficient the process was, so he calculated the compression ratio and explained what it meant in terms of data saving. Later, he experimented with a different method that gave a ratio of 6:1, and he wondered how that would affect the image quality compared to the previous one. Students are asked to:

   1. Compute the compression ratio for the first case.
   2. Explain, in simple terms, how the second method (with ratio 6:1) would likely affect the visual quality of the restored image.
   3. Discuss whether higher compression always means better efficiency.

2. While restoring an old digital photo of her pet cat, a student noticed that some pixels suddenly appeared pure white or black, even though the surrounding areas looked normal. Curious, she wanted to figure out what kind of random disturbance could cause such sudden changes in brightness. She measured one small patch of 10×10 pixels (total 100 pixels) and found that 7 of them were completely corrupted with either 0 or 255 intensity values. Students are asked to:

   1. Identify what type of noise could cause this kind of distortion.
   2. Calculate the percentage of corrupted pixels in that region.
   3. Suggest one filtering approach that could reduce such noise while preserving the image details.