C7-R4 : DIGITAL IMAGE PROCESSING AND COMPUTER VISION

NOTE :
1. **Answer question 1 and any FOUR questions from 2 to 7.**
2. **Parts of the same question should be answered together and in the same sequence.**

Time : 3 Hours   **Total Marks : 100**

1. (a) Define color Model, Hue and Saturation.

   (b) What is meant by illumination and reflectance ?

   (c) List types of pixel neighborhood. Define any two.

   (d) Explain sampling and quantization.

   (e) Give the relation between Rayleigh noise and Gamma noise.

   (f) Define Aspect Ratio. Find the number of bits required to store a 256×256 image with 32 gray levels.

   (g) Explain edge detection using sobel operator.   **(7x4)**

2. (a) Describe the fundamental steps in image processing.

   (b) Perform histogram equalization of the following image having gray levels 0-15 and find equalized image.

Gray Level :	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
No. of Pixel :	15	0	0	0	0	0	0	0	0	70	110	45	80	40	0	0

   (c) What are gray level transformations ? Define gray level slicing and contrast stretching.   **(6+6+6)**

3. (a) Describe the method to convert color from RGB to HSI and HSI to RGB.

   (b) For the image shown below compute the compression ratio that can be achieved using Huffman coding; color range [0 - 3] :

3	3	3	2
2	3	3	3
3	2	2	2
2	1	1	0

   (c) Explain Orthographic and Perspective Projection.   **(6+6+6)**

4. (a) List out types of mean filters. Briefly explain any two mean filters.

(b) Describe 1st and 2nd order derivative for the scan line mentioned below. Show Ramp and Step graphically.

5	5	4	3	2	1	0	0	0	6	0	0	0	0	1	3	1	0	0	0	0	7	7	7

(c) Define pyramid in image processing. Describe types of pyramid and explain how they are generated.   **(6+6+6)**

5. (a) Define Region Based Segmentation. Explain procedure of Region Splitting and Merging.

(b) Explain Correlation and Convolution. Apply correlation and convolution on image and mask given below :

f : 0 0 0 1 0 0 0 0

w : 1 2 3 2 8

(c) Explain the morphological operations : dilation and erosion. Justify whether dilation and erosion are invertible operations ?   **(6+6+6)**

6. (a) Explain Un-sharp Masking & High Boost Filtering.

(b) Write a short note on Multi Resolution Analysis.

(c) Define Motion Estimation. Describe the types of motion estimation with applications.   **(6+6+6)**

7. (a) Describe the functionality of JPEG encoder and decoder using block diagram.

(b) Discuss steps of Hough transform for line detection.

(c) What is Fourier Transform & why it is important in Image Processing ?   **(6+6+6)**

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