BE8-R3: DIGITAL IMAGE PROCESSING

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) If $h_i \times 100\%$ is the percentage of pixels within an image at i^{th} gray level, then give formulae for brightness and contrast of the image. $(0 \le i \le G_{max})$.
b) With a block diagram explain different component of a image processing system.
c) What do you mean by hue? How does it different from color?
d) Obtain the Haar transform matrix for H=8.
e) Give the transformation matrix used to rotate an image by 45° clockwise.
f) Give a procedure for filling holes in objects.
g) What do you mean by Psychovisual Redundancy?

(7×4)

2.
a) Give pseudo code to compute the histogram of an image.
b) Critically comment about the quality of the images with respect to following:
    i)   Histogram clustered at the low end.
    ii)   Histogram clustered at the high end.
    iii) Histogram with a small spread.
    iv)   Histogram with a wide spread.
c) An image is represented by the following table

Graylevels	0	1	2	3	4	5	6	7
No. of pixels	1116	4513	5420	2149	1389	917	654	226

Find an image from this image after histogram equalization.

(4+4+10)

3.
a) Define 4-, 8- and m-adjacency.
b) What are neighborhood operations? What role do they play in object recognition?
c) What do you mean by Monochrome Image Quantization? How is it different from Color Image Quantization?

(6+6+6)

4.
a) Write Steps for Filtering in the Frequency Domain.
b) Give a procedure for Projection of images through Eigenspace and a mechanism to test an unknown image in the projected space.

(8+10)

5.
a) Why is image enhancement different from image restoration? What is color interpolation or de-mosaicing?
b) What do you understand by Pseudo Color image processing?
c) Discuss dilation and erosion as morphological operators.

(6+6+6)

6.
a)   Show that the inverse filter of a spatially invariant system will also be spatially invariant.
b)   Discuss salient features of JPEG2000 that make it effective in vast areas of applications.
c)   What are the advantages of the lifting-based DWT over the convolution-based approach?

(4+8+6)

7.
a)   Explain the action of following spatial mash on an image.

0	-1	0
-1	4	-1
0	-1	0

b)   Discuss texture analysis using Angular second moment, Contrast and Correlation.
c)   Can variable-length coding procedures be used to compress a histogram equalized image with z^n gray levels? Explain.

(4+6+8)