USN

Seventh Semester B.E. Degree Examination, Dec.2017/Jan.2018
Image Processing

Time: 3 hrs.   Max. Marks:100

Note: *Answer any FIVE full questions, selecting*
at least TWO questions from each part.

PART – A

1 a. With a neat block diagram, explain the steps in image processing. **(10 Marks)**
   b. Explain the following terms as application to image processing with necessary graphs: Brightness adaptation, webers ratio, Mach bands and distance measure. **(10 Marks)**

2 a. Explain with suitable diagram how an image is acquired using a circular sensor strip. **(06 Marks)**
   b. Consider the image segment shown in Fig.Q2(b):
       i) Let V = {0, 1}. Compute the length of shortest 4, 8 and m paths between p and q.
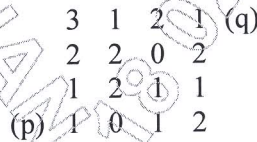   ii) Repeat for V = {1, 2}.

$$
\begin{array}{cccc}
3 & 1 & 2 & 1 \ (q) \\
2 & 2 & 0 & 2 \\
1 & 2 & 1 & 1 \\
(p) \ 1 & 0 & 1 & 2 \\
\end{array}
$$

Fig.Q2(b) **(08 Marks)**
   c. Explain an image acquisition using a sensor arrays. **(06 Marks)**

3 a. Find the orthogonal matrix A and U and also obtain basic images. **(08 Marks)**
   b. Explain properties of unitary transforms. **(04 Marks)**
   c. Construct Haar transform matrix of N = 8 and state its properties. **(08 Marks)**

4 a. Construct 4 × 4 DFT matrix and show that it is unitary. **(10 Marks)**
   b. Determine 4 × 4 Slant transform matrix. List its properties. **(10 Marks)**

PART – B

5 a. Perform histogram equalization for the following image data. Sketch the histogram of original image and histogram of equalized image. **(10 Marks)**

r_K	0	1	2	3	4	5	6	7
n_K	790	1023	850	656	329	245	122	81

   b. Explain the following image enhancement techniques, highlighting their area of application. Explain the (i) intensity level slicing, (ii) Power law transformation, (iii) Thresholding transformation, with transfer function and relevant expression. **(10 Marks)**

6 a. Explain the homomorphic filtering approach for image enhancement. **(10 Marks)**
   b. Justify the statements "median filter is an effective tool to minimize salt and pepper noise" using the foll image segment.

$$
\begin{bmatrix}
24 & 22 & 23 & 25 & 32 & 24 \\
34 & 255 & 24 & 0 & 26 & 23 \\
23 & 21 & 32 & 31 & 28 & 26 \\
\end{bmatrix}
$$

(10 Marks)

7 a. Explain the model of image degradation/restoration. **(08 Marks)**
   b. Explain different noise probability density functions in image restoration process. **(12 Marks)**

8 a. Explain the RGB, HSI and CMY/CMYK color model. **(12 Marks)**
   b. With the help of expressions describe how to convert colors from RGB to HSI and HSI to RGB. **(08 Marks)**

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