Seventh Semester B.E. Degree Examination, Jan./Feb. 2023
Digital Image Processing

Time: 3 hrs.   Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1   a.   Explain the various components of Image Processing System, with neat block diagram. **(08 Marks)**

  b.   Explain the process of Image Acquisition, using sensor strips to generate 2D - Image. **(08 Marks)**

  c.   Image transmission is done in packets. A packet consists of a start bit, a byte of data and a stop bit. Find
      i)   How many minutes would it take to transmit a 512×512 image with 256 grey levels at 300 baud rate.
      ii) What would be the time at 9600 baud? **(04 Marks)**

OR

2   a.   Explain the importance of brightness adaption and discrimination in Image processing. **(08 Marks)**

  b.   List four major applications of Image processing. **(04 Marks)**

  c.   For $V = \{2, 3, 4\}$, compute the lengths of shortest 4, 8, m paths between p and q in the following image. If a particular path does not exist between these three points, explain why. Repeat for $V = \{0, 1, 2, 4\}$. **(08 Marks)**

$$\begin{array}{ccccc}
3 & 4 & 1 & 2 & 0 \\
0 & 1 & 0 & 4 & 2 \ (q) \\
2 & 2 & 3 & 1 & 4 \\
(p)\ 2 & 0 & 4 & 2 & 1 \\
1 & 2 & 0 & 3 & 4 \\
\end{array}$$

Module-2

3   a.   Explain the power law transformation and piece – wise linear bit plane slicing with a neat graphical illustration. **(10 Marks)**

  b.   Explain the sharpening of Image in frequency domain using :
      i) Ideal High pass filter   ii) Butterworth High pass filter   iii) Gaussian High pass filter. **(10 Marks)**

OR

4   a.   Explain with a block diagram, the basic steps for image filtering frequency domain. **(06 Marks)**

  b.   Perform the histogram equalization of 8 level image of size 64×64 whose data is shown in table Q4(b).

Grey level r_k	0	1	2	3	4	5	6	7
Number of Pixels	123	78	281	417	639	1054	816	688

Table Q4(b) **(08 Marks)**

  c.   Explain 2D – DFT and mention Translation and Symmetry properties of 2D - DFT. **(06 Marks)**

Module-3

5 a. With neat block diagram and relevant mathematical expressions, explain Image Degradation / Restoration model. **(06 Marks)**

b. Explain Alpha Trimmed mean filter with necessary equations. **(06 Marks)**

c. Show the effect of 3×3 midpoint, min max and median filter on an given Image Segment.

0	1	2	3	4
5	6	7	8	9
5	5	5	9	9
5	5	5	9	9
5	5	5	9	9

(08 Marks)

OR

6 a. With necessary diagrams and relevant equations, explain any four noise probability density functions. **(10 Marks)**

b. Explain with necessary expression the Periodic Noise reduction by frequency domain filtering. **(10 Marks)**

Module-4

7 a. Explain with necessary diagram, the RGB colour model. **(08 Marks)**

b. Explain the conversion of RGB to HSI color model and HSI to RGB colour model. **(08 Marks)**

c. Explain Boundary Extraction using Morphological Algorithm. **(04 Marks)**

OR

8 a. Write a note on Pseudo colour Image Processing. Explain Intensity slicing as applied to pseudo colour Image Processing. **(10 Marks)**

b. Explain Errosion and Dialation in Image Processing. **(10 Marks)**

Module-5

9 a. Explain Segmentation with respect to an Image. Write note on applications of Image Segmentation. **(08 Marks)**

b. Explain Global thresholding using Otsu's method. **(08 Marks)**

c. Define Length and diameter of a boundary with respect to image. **(04 Marks)**

OR

10 a. Write short notes on Image Segmentation by region splitting and merging. **(06 Marks)**

b. Explain Boundary representation by Chain codes. **(08 Marks)**

c. Explain Point detection with respect to Image Segmentation. **(06 Marks)**

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