USN ☐☐☐☐☐☐☐☐☐☐   **18CS741**

Seventh Semester B.E. Degree Examination, Feb./Mar. 2022
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. With a neat diagram, explain the fundamental steps in Digital Image Processing. **(10 Marks)**
  b. Consider the image segment shown in Fig Q1(b). i) Let $V = \{0, 1\}$ and compute the length of the shortest 4, 8 and m-path between p and q   ii) Repeat for $V = \{1, 2\}$
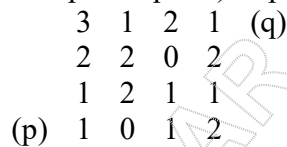
$$
\begin{array}{cccc}
3 & 1 & 2 & 1 \ (q) \\
2 & 2 & 0 & 2 \\
1 & 2 & 1 & 1 \\
(p) \ 1 & 0 & 1 & 2
\end{array}
$$

Fig Q1(b)   **(10 Marks)**

OR

2 a. Explain the concept of sampling and quantization with necessary diagrams. **(10 Marks)**
  b. Explain the different distance measures between the pixels in an Image. **(05 Marks)**
  c. List any five example fields that use digital image processing. **(05 Marks)**

Module-2

3 a. Explain the following gray level transformations with a neat graph i) Log Transformation ii) Power Law Transformations. **(10 Marks)**
  b. Describe how the first order derivatives are used for Image Sharpening. **(10 Marks)**

OR

4 a. Explain the different spatial filters used for Image Smoothing. **(10 Marks)**
  b. What is image histogram? Discuss histogram equalization for Image enhancement. **(10 Marks)**

Module-3

5 a. Obtain the equation for one dimensional Discrete Fourier Transform and its inverse from the continuous transform of sampled function of one variable. **(10 Marks)**
  b. Explain the steps involved in Image filtering in frequency domain. **(10 Marks)**

OR

6 a. Explain any five properties of two dimensional DFT. **(10 Marks)**
  b. Discuss about two dimensional DFT and its inverse. **(10 Marks)**

Module-4

7 a. Discuss the procedure of obtaining the segmented regions using split and merge strategy with example. **(10 Marks)**

b. Explain the technique for detecting three basic types of gray level discontinuities in a digital Image. **(10 Marks)**

OR

8 a. Describe the procedure of detecting lines using Hough Transform. **(10 Marks)**

b. Discuss Image segmentation using Thresholding in detail. **(10 Marks)**

Module-5

9 a. What is Image compression? Describe the general Image compression models with a neat block diagram. **(10 Marks)**

b. Explain the Huffman compression technique obtain the Huffman code for the following data given in Table Q9(b). Also compute the average length of the code.

Symbol	a_1	a_2	a_3	a_4	a_5	a_6
Probability	0.1	0.4	0.06	0.1	0.04	0.3

Table Q9(b) **(10 Marks)**

OR

10 a. Explain Arithmetic coding technique. Calculate arithmetic code for the message $a_1\ a_2\ a_3\ a_3\ a_4$. Probability and subinterval of each source symbol in given below in Table Q10(a).

Source symbol	Probability	Initial subinterval
a_1	0.2	[0.0, 0.2]
a_2	0.2	[0.2, 0.4]
a_3	0.4	[0.4, 0.8]
a_4	0.2	[0.8, 0.1]

Table Q10(a) **(10 Marks)**

b. Explain coding Redundancy by taking suitable example. **(10 Marks)**

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