CBCS SCHEME

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18EI642

Sixth Semester B.E. Degree Examination, July/August 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. Explain the fundamental steps in Digital Image Processing. **(10 Marks)**

b. Briefly explain the following terms:
(i) Neighbors of a pixel.
(ii) Distance measures.
(iii) Adjacency of pixels. **(10 Marks)**

OR

2 a. Explain the conversion of colors from RGB to HIS and vice versa. **(10 Marks)**

b. Explain the working principle of the following imaging processes:
(i) Ultrasound imaging.
(ii) Electron microscopy.
(iii) Transmission Electron microscopy.
(iv) Scanning Electron microscopy. **(10 Marks)**

Module-2

3 a. Apply first order derivatives to enhance an image in spatial domain. **(10 Marks)**

b. Consider a 3-bit image of size 64×64 pixels, which has the intensity distribution as shown in table Q3 (b) below. Obtain the histogram equalization of this image.

r_k	n_k
$r_0 = 0$	790
$r_1 = 1$	1023
$r_2 = 2$	850
$r_3 = 3$	656
$r_4 = 4$	329
$r_5 = 5$	245
$r_6 = 6$	122
$r_7 = 7$	81

(10 Marks)

OR

4 a. Apply piecewise linear transformation techniques for enhancing an image. **(10 Marks)**

b. Apply basic intensity transformation techniques for enhancing an image in spatial domain. **(10 Marks)**

Module-3

5 a. Define two-dimensional DFT and explain its properties. **(12 Marks)**

b. Analyze homomorphic filtering to enhance an image in frequency domain. **(08 Marks)**

OR

6 a. Apply frequencies domain filters to smoothen an image. **(08 Marks)**

b. With a neat block diagram, explain the basic steps of filtering an image in frequency domain. **(04 Marks)**

c. Apply filters to sharpen an image in frequency domain. **(08 Marks)**

Module-4

7 a. Explain the image degradation/restoration process with a block diagram. **(08 Marks)**

b. Discuss the different noise probability density functions found in image processing applications. **(12 Marks)**

OR

8 a. Explain the principal types of data redundancies. **(06 Marks)**

b. Consider the following table representing encoding of data in two different codes. Compute the following for each Code-1 and Code-2.

(i) Average codeword length.

(ii) Number of bits required to represent an image of size 256×256.

(iii) Compression ratio.

(iv) Relative redundancy

r_k	$P_r(r_k)$	Code-1	Code-2
$r_{87} = 87$	0.25	01010111	01
$r_{128} = 128$	0.47	10000000	1
$r_{186} = 186$	0.25	11000100	000
$r_{255} = 255$	0.03	11111111	001
r_k for $k \neq 87,128,186,255$	0	-	-

(04 Marks)

c. Analyze the arithmetic code to encode the message "went•", with the following probabilities:

Source Symbol	Probability
e	0.3
n	0.3
t	0.2
w	0.1
•	0.1

(10 Marks)

Module-5

9 a. Explain the basics of intensity thresholding. Also discuss the factors that affect the success of intensity thresholding. **(08 Marks)**

b. Develop an algorithm to perform edge detection using Canny approach. **(12 Marks)**

OR

10 a. Discuss different edge models with their respective intensity profiles. **(08 Marks)**

b. Discuss the following with respect to region based segmentation:

(i) Region Growing.

(ii) Region splitting and merging. **(12 Marks)**

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