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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belgaum)

Sixth Semester, B.E. - Electronics and Communication Engineering

Make-up Examination; July - 2016

Digital Image Processing

Time: 3 hrs

Max. Marks: 100

Note: i) Answer **FIVE** full questions, selecting **ONE** full question from each unit.

ii) Assume missing data suitably.

UNIT - I

1 a. Define Digital Image Processing and describe the use of Digital Image Processing for Medical applications. 8

b. Explain the fundamental steps in digital image processing with block diagram. 12

2 a. Sketch and explain Brightness Adaptation and Discrimination curve. 6

b. Compute the following for the given image segment,

	3	1	2	1	(q)
	2	2	0	2	
	1	2	1	1	
(p)	1	0	2	2	

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i) The length of the shortest 4, 8 and m path between p and q (consider $v = \{0, 1\}$)

ii) Euclidean distance between p and q

iii) D8-distance (chess board distance) between p and q.

c. Explain the basic concepts in image sampling and quantization. 7

UNIT - II

3 a. Evaluate resultant matrix for the given image segment matrix,

$$\begin{bmatrix} 1 & 5 & 7 \\ 2 & 4 & 6 \\ 3 & 2 & 1 \end{bmatrix}$$

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i) Image Negative ii) Log transformations (Assume $C = 5$).

b. Explain the following piece wise-Linear transformation function :

i) Contrast stretching 8

ii) Intensity level slicing.

c. Show that the $P_S(S)$ is a uniform probability density function in histogram equalization process. 8

- 4 a. Outline the importance of local histogram processing. Find the mean and second moment of 2-bit image of size 5x5.

0	0	1	1	2	
1	2	3	0	1	
3	3	2	2	0	
2	3	1	0	0	
1	1	3	2	2	

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- b. Describe the basic steps involved in frequency domain filtering with a diagram.
 c. Write the DFT expressions required for 2D-image processing.

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UNIT - III

- 5 a. Write any four noise model probability density function with their ideal responses.
 b. Explain the following spatial filtering methods in the presence of noise,
 i) Contra harmonic mean filter
 ii) Alpha-trimmed mean filter
 iii) Max and Min filter
 iv) Midpoint filters.

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- 6 a. Explain the model of image Degradation/Restoration process.
 b. Explain Wiener filtering with related equations.
 c. Define Adaptive filter and write about its behavior that we want.

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UNIT - IV

- 7 a. Outline the steps required for Otsu's algorithm.
 b. Illustrate segmentation of isolated points in an image with aid of equations.
 c. State the region-growing algorithm based on 8-connectivity.
 8 a. Explain Erosion and Dilation morphological processing operations.
 b. List the properties that satisfy opening and closing operations.
 c. Describe boundary extraction with aid of expression.

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UNIT - V

- 9 a. Explain the RGB color model with the schematic of RGB color cube.
 b. Write the procedure required for converting colors from HSI to RGB.
 c. Explain CMY-color model.
 10 a. Describe functional block diagram of a general image compression system.
 b. Explain with block diagram a lossless predictive coding model for encoder and decoder.
 c. Write short note on digital image water marking.

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