

Code No: RT41043

**R13**

**Set No. 1**

IV B.Tech I Semester Regular/Supplementary Examinations, October/November - 2017

**DIGITAL IMAGE PROCESSING**

(Common to Electronics and Computer Engineering, Electronics and Communication Engineering and Electronics and Instrumentation Engineering)

Time: 3 hours

Max. Marks: 70

*Question paper consists of Part-A and Part-B*

*Answer ALL sub questions from Part-A*

*Answer any THREE questions from Part-B*

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**PART-A (22 Marks)**

1. a) Define  $D_4$  and  $D_8$  distances. [3]
- b) What are the advantages of filtering in frequency domain? [4]
- c) How to estimate the degradation function by experimentation? [4]
- d) Define brightness, hue and saturation. [3]
- e) Write short notes on spatial redundancy. [4]
- f) Write short notes on morphological gradient. [4]

**PART-B (3x16 = 48 Marks)**

2. a) What is meant by image interpolation? Discuss about various interpolation methods. [8]
- b) What is the need of image transform? List out various transform used in image processing. [8]
3. a) With an example, explain the concept of histogram equalization. [8]
- b) State 2D sampling theorem and explain about aliasing in images. [8]
4. a) Explain about noise reduction in an image using band reject and band pass filters. [8]
- b) Explain the concept of minimum mean square error filtering. [8]
5. a) Explain about RGB color model and write its applications. [8]
- b) Describe about histogram processing in color images. [8]
6. a) Draw the diagram of two band subband coding and decoding system, and explain it. [8]
- b) With an example, explain about arithmetic coding. [8]
7. a) Discuss about opening and closing for gray scale images. [8]
- b) Explain the detection of isolated points in an image. [8]



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**Set No. 2**

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**PART-A (22 Marks)**

1. a) What is meant by spatial resolution and explain its significance. [4]
- b) Define Fourier spectrum and Phase angle of 2D-DFT. [3]
- c) Write short notes on Max and Min filters. [4]
- d) Write short notes on chromaticity and tristimulus values. [4]
- e) Explain about subjective fidelity criteria. [3]
- f) Explain the duality of erosion and dilation operations. [4]

**PART-B (3x16 = 48 Marks)**

2. a) Explain the following terms:  
(i) Adjacency (ii) Connectivity (iii) Regions (iv) Boundaries [8]
- b) Obtain the Haar transformation matrix for  $N = 8$ . [8]
3. a) Explain the use of histogram statistics for image enhancement. [8]
- b) Prove the validity of the discrete convolution theorem of two variables. [8]
4. a) What is an adaptive median filter? Explain its use for noise reduction in an image. [8]
- b) With an example, explain the concept of image reconstruction from back projections. [8]
5. a) Discuss about CMY and CMYK color models. [8]
- b) Discuss about noise in color images. [8]
6. a) Explain the concept of wavelet packets and write its advantages. [8]
- b) Draw the functional block diagram of general image compression system and explain it. [8]
7. a) Explain the following morphological algorithms:  
(i) Boundary extraction (ii) Hole filling [8]
- b) Define image gradient and explain its use in edge detection. [8]



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*Answer any THREE questions from Part-B*

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**PART-A (22 Marks)**

1. a) Compute the Haar transform of the 2 X 2 image  $F = \begin{bmatrix} 3 & -1 \\ 6 & 2 \end{bmatrix}$  [4]
- b) What is Log Transformation and write its use in image processing. [3]
- c) Write the expression for contraharmonic mean filter and explain its use in image restoration. [4]
- d) What is the purpose of color model and list out some color models. [4]
- e) What is image compression? Why it is needed? [4]
- f) List out different masks used to compute the gradient. [3]

**PART-B (3x16 = 48 Marks)**

2. a) Explain the basic concepts of sampling and quantization in the generation of digital image. [8]
- b) Discuss about KL Transform and write its applications in image processing. [8]
3. a) Determine the convolution and correlation between the following images:
 
$$f(x, y) = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix} \text{ and } g(x, y) = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$$
 [8]
- b) Explain the following filters: [8]  
 (i) Band reject and Band pass filters (ii) Notch filters
4. a) What are the different approaches to estimate the noise parameters in an image? Explain. [8]
- b) State and explain the Fourier-Slice Theorem. [8]
5. a) Discuss the concept of converting colors from RGB to HSI. [8]
- b) With necessary equations, explain about color edge detection. [8]
6. a) What are the various Multiresolution analysis requirements? Explain. [8]
- b) What is meant by block transform coding? Explain. [8]
7. a) Explain about morphological hit-or-miss transform. [8]
- b) Discuss about edge linking using local processing. [8]



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**PART-A (22 Marks)**

1. a) Define Walsh Transform and write its properties. [4]
- b) What is meant by gamma correction? Why it is needed? [3]
- c) Write the difference between image restoration and image enhancement. [4]
- d) Write short notes on RGB to CMY conversion. [4]
- e) Write the difference between Fourier transform and wavelet transform. [4]
- f) Explain the effect of noise in edge detection. [3]

**PART-B (3x16 = 48 Marks)**

2. a) Explain about linear and nonlinear operations used in image processing. [8]
- b) State and Prove the translation and rotation properties of 2D-DFT. [8]
3. a) Explain the concept of weighted average filter. [8]
- b) With necessary equations, explain the concept of homomorphic filtering. [8]
4. a) List out some important noise probability density functions used in image processing and sketch their plots. [8]
- b) Discuss about Radon Transform and write its applications. [8]
5. a) Explain about intensity slicing and write its applications. [8]
- b) Discuss about segmentation in RGB vector space. [8]
6. a) Explain about wavelet transform in two dimensions. [8]
- b) Draw the block diagram of lossless predictive coding model and explain it. [8]
7. a) Explain the following morphological operations:
  - (i) Erosion
  - (ii) Dilation
 [8]
- b) Explain the basics of intensity thresholding in image segmentation. [8]

