# R16

### IV B.Tech I Semester Regular/Supplementary Examinations, March - 2021
## DIGITAL IMAGE PROCESSING
### (Common to Electronics & Communication Engineering and Electronics & Instrumentation Engineering and Electronics & Computer 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 FOUR questions from Part-B*
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## PART–A *(14 Marks)*

| | | | |
|---|---|---|---|
| 1. | a) | Explain the function of image sensor. | [3] |
| | b) | What are the advantages of filtering in frequency domain? | [3] |
| | c) | Write the difference between image restoration and image enhancement. | [2] |
| | d) | Compare orthogonal and bi-orthogonal wavelets. | [2] |
| | e) | Explain how a point can be detected in an image. | [2] |
| | f) | What is the purpose of color model? Explain. | [2] |

## PART–B *(4x14 = 56 Marks)*

| | | | |
|---|---|---|---|
| 2. | a) | What is the need of image transform? List out various transforms used in Image Processing. | [7] |
| | b) | Derive the basis function of Walsh transform. | [7] |
| | | | |
| 3. | a) | State and prove conjugate symmetry and orthogonality property of 2D DFT. | [7] |
| | b) | Explain about histogram specifications. | [7] |
| | | | |
| 4. | a) | Explain Spatial filtering in Image enhancement. | [7] |
| | b) | Define and Explain the geometric mean filtering. Write the advantages and disadvantages. | [7] |
| | | | |
| 5. | a) | Draw and explain the general image compression system model. | [9] |
| | b) | Write a short note on Wavelet Packets. | [5] |
| | | | |
| 6. | a) | How can you control Over segmentation problem? Explain it. | [7] |
| | b) | Explain about morphological hit-or-miss transform. | [7] |
| | | | |
| 7. | a) | What is color image smoothing? Explain how smoothing will done by neighborhood averaging. | [9] |
| | b) | Briefly discuss about Complements on the color circle. | [5] |

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Code No: **R1641042**　　**R16**　　Set No. 2

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## PART–A *(14 Marks)*

1.　a)　Write some applications of KL transform.　　　　　　　　　　　　[3]
　　b)　Differentiate between linear spatial filter and non-linear spatial filter.　　[3]
　　c)　How to estimate the degradation function by experimentation.　　　　[2]
　　d)　Write the difference between Fourier transform and wavelet transform.　[2]
　　e)　Explain the effect of noise on edge detection.　　　　　　　　　　[2]
　　f)　What is Image segmentation based on color.　　　　　　　　　　　[2]

## PART–B *(4x14 = 56 Marks)*

2.　a)　Explain the following terms:
　　　　(i) Adjacency　(ii) Connectivity　(iii) Regions　(iv) Boundaries　　[7]
　　b)　Compute Haar Transform for following N Value. N=8.　　　　　　　[7]

3.　a)　With an example, explain the concept of histogram equalization.　　　[7]
　　b)　Explain Spatial filtering in Image enhancement.　　　　　　　　　[7]

4.　a)　Explain the need for Image restoration.　　　　　　　　　　　　　[7]
　　b)　Explain about periodic noise reduction using frequency domain filtering.　[7]

5.　a)　Write short notes on Image Pyramids and Sub band coding.　　　　　[7]
　　b)　What are the various Multi resolution analysis requirements? Explain.　[7]

6.　a)　Explain the significance of thresholding in image segmentation.　　　[7]
　　b)　Define the morphological operation and Explain the following:
　　　　(i) Erosion　　　(ii) Dilation　　　　　　　　　　　　　　　[7]

7.　a)　Explain pseudo color image processing and pseudo color coding approaches.　[8]
　　b)　Write significance of RGB color model and Explain about it.　　　　[6]

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## PART–A *(14 Marks)*

1. a) Define neighborhood of a pixel. [3]
   b) What is log transformation? How it is useful in image processing. [3]
   c) Write the drawback of inverse filtering. [2]
   d) What do you meant by wavelet packet? [2]
   e) What is meant by image segmentation? Write its use in image processing. [2]
   f) Write the purpose of color model. [2]

## PART–B *(4x14 = 56 Marks)*

2. a) State 2D sampling theorem and explain about aliasing in images. [7]
   b) Explain about KL Transform with an example. [7]

3. a) Explain the use of first derivative for image enhancement by taking a 3×3 region of image using the magnitude of the gradient. [7]
   b) Define Histogram of Image. Explain the concept of Histogram Equalization technique for Image enhancement. [7]

4. a) Explain the concept of Inverse Filtering and also mention the limitations of it. [7]
   b) Explain the concept of minimum mean square error filtering. [7]

5. a) Describe arithmetic coding with an example for compression of image. [7]
   b) What is meant by block transform coding? Explain. [7]

6. a) Explain the basics of intensity thresholding in image segmentation. [7]
   b) Prove that Erosion and Dilation are dual to each other. [7]

7. a) Discuss the procedure for conversion from RGB color model to HSI color model. [7]
   b) Describe the histogram based processing in color images. [7]

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## PART–A *(14 Marks)*

1.  a)  What is the need for image transform? Explain.                                   [3]
    b)  Write short notes on selective filtering.                                        [3]
    c)  Give the relation for degradation model for Continuous function.                 [2]
    d)  What is the need for Compression?                                                [2]
    e)  Write short notes on morphological gradient.                                     [2]
    f)  Explain color complements.                                                       [2]

## PART–B *(4x14 = 56 Marks)*

2.  a)  Explain the fundamental steps in digital image processing which can be applied
        to images.                                                                      [7]
    b)  Give any five properties of two dimensional DFT.                                 [7]

3.  a)  Explain about image smoothing using Ideal low pass filter.                       [7]
    b)  How Gray level transformation helps in contrast enhancement? Discuss.            [7]

4.  a)  What is the purpose of image restoration? Explain the model of image
        degradation and restoration process using suitable block diagram.               [7]
    b)  With an example, explain the concept of image reconstruction from projections.   [7]

5.  a)  Draw the block diagram of lossless predictive coding model and explain it.       [7]
    b)  Explain about wavelet transform in two dimensions.                               [7]

6.  a)  Explain about Boundary Extraction and Region Filling Algorithm.                  [7]
    b)  Explain watershed transformation and discuss about its advantages and
        disadvantages.                                                                  [7]

7.  a)  Explain about color segmentation process.                                        [7]
    b)  Discuss any two color models used in color image processing.                     [7]

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