A **Reg. No. :** | | | | | | | | | | |

Question Paper Code: 56B02

B.E. / B.Tech. DEGREE EXAMINATION, APRIL 2019

Sixth semester

Biomedical Engineering

15UBM602- IMAGE PROCESSING TECHNIQUES

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. An image is considered to be a function of a(x,y) where a represents CO1-R

   (a) Height of image (b) Width of image

   (c) Amplitude of image (d) Resolution of image

2. _____ is used for recording images for hardcopy devices. CO1-R

   (a) Optical filter (b) Touch screen (c) Heat –sensitive device (d) Transparent film

3. How is array operation carried out involving one or more images? CO2-R

   (a) Array by array (b) Pixel by pixel (c) Column by column (d) Row by row

4. _____ tool used in tasks such as zooming, shrinking, rotating, etc., CO2-R

   (a) Sampling (b) Interpolation (c) Filters (d) Enhancement

5. _____ image processing technique used to improve the quality of image for human viewing. CO3-R

   (a) Compression (b) Enhancement (c) Restoration (d) Analysis

6. _____ type of enhancement operations are used to modify pixel values according to the value of the pixel's neighbors. CO3-R

   (a) Point operations (b) Local operations (c) Global operations (d) Mask operations

7. Recall the color attribute that gives a measure of the degree to which a pure color is diluted by white light. CO4-R

(a) Saturation (b) Intensity (c) Pixel (d) Hue

8. Region of Interest (ROI) operations is commonly called as _____. CO4-R

(a) Dilation (b) Masking (c) Shading correction (d) Restoration

9. Compression ratio is expressed as _____. CO5-R

(a) Original size/compressed size (b) Original pixel/compressed pixel

(c) Compressed size/ original size (d) Compressed pixel / original pixel

10. In 8- distance measurement system, distance between centre pixel and a corner pixel is _____. CO5-R

(a) 2 unit (b) √2 unit (c) 1 unit (d) 1.5 unit

PART – B (5 x 2= 10 Marks)

11. List the elements of digital image processing systems. CO1-R

12. The noise is always considered to be additive in images – Justify. CO2-Ana

13. Differentiate enhancement from restoration. CO3-Ana

14. Indicate the condition to be met by the partitions in region based segmentation. CO4-R

15. Identify the need for data compression. CO5-R

PART – C (5 x 16 = 80 Marks)

16. (a) (i) How an RGB model is represented using HSI format? CO1-Ana (6)

(ii) Compute the 2D DFT of the 4x4 gray scale image given below. Also verify the result by computing its inverse DFT. CO1-App (10)

$$f(m,n) = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \end{bmatrix}$$

Or

(b) (i) Outline the principle of sampling and quantization. CO1-Ana (6)

(ii) Explain the computations of K-L transform for an image and compute the basis of the K-L transform for the input data $x_1=(4,4,5)^T$; $x_2=(3,2,5)^T$; $x_3=(5,7,6)^T$; $x_4=(6,7,7)^T$. CO1-App (10)

17. (a) (i) How is a monochrome image enhanced by histogram equalization? CO2-Ana (6)

(ii) Perform histogram equalization of the following image. CO2-App (10)

$$\begin{pmatrix} 4 & 4 & 4 & 4 & 4 \\ 3 & 4 & 5 & 4 & 3 \\ 3 & 5 & 5 & 5 & 3 \\ 3 & 4 & 5 & 4 & 3 \\ 4 & 4 & 4 & 4 & 4 \end{pmatrix}$$

Or

(b) (i) Explain the various sharpening filters used in spatial domain. CO2-U (8)

(ii) Illustrate the colour image enhancement techniques. CO2-U (8)

18. (a) (i) Define image restoration. Explain the degradation model for continuous function. CO3-U (10)

(ii) Compare the Constrained and Unconstrained restoration. CO3-Ana (6)

Or

(b) Outline the Wiener filtering approach for image restoration and list its advantages over inverse filter. CO3-Ana (16)

19. (a) (i) Show with relevant equations how point, line and edge detectors are used for image segmentation. CO4-U (8)

(ii) Illustrate the process of edge linking using Hough transform. CO4-U (8)

Or

(b) (i) Explain region splitting and merging technique for image segmentation with suitable examples. CO4-U (10)

(ii) Summarize the basic concepts of segmentation by morphological watersheds. CO4-U (6)

20. (a) (i) Outline the Huffman coding procedure with an example. CO5-U (8)

(ii) How run length encoding approach is used for compression? CO5-U (8)

Or

(b) (i) Differentiate lossless compression from lossy compression and explain transform coding system. CO5-U (10)

(ii) Compare the JPEG and MPEG standards. CO5-U (6)