Reg. No. : | | | | | | | | | | | | |

Question Paper Code: U6403

B.E. / B.Tech. DEGREE EXAMINATION, APRIL / MAY 2025

Sixth Semester

Electronics and Communication Engineering

21UEC603 - IMAGE PROCESSING AND ANALYSIS

(Regulations 2021)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 1 = 5 Marks)

1. Which transformation is used, to change the size of an object? CO2-App

   a) scaling transformation b) vector transformation

   c) simple transformation d) reflection transformation

2. In general, the log transformation can be represented by _____ CO1-U

   a) s = c.log (1 - r) b) s = c - log (1 - r) c) s = c.log (1 + r) d) s = c + log (1 + r)

3. Canny edge detection algorithm is based on, CO1-U

   a) Ideal model b) step edge c) real model d) smoothing model

4. ----------is a pooling operation that selects the maximum element from the region of the feature map covered by the filter. CO1-U

   a) Max Pooling b) Average Pooling c) Global pooling d) None of these

5. _____methods are used to group data samples into different classes CO1-U

   a) Clustering b) Segmentation c) Classification d) Pattern recognition

PART – B (5 x 3= 15 Marks)

6. Your headlights have a radiant intensity of 60 W_{sr}-1. Determine the irradiance on a sign 2m away. CO2-App

7. Given a simple image of size 10×10 whose histogram models the symbol probabilities and is given by CO2-App

P1	P2	P3	P4
a	b	c	d

When the first order estimate of image entropy is maximum?

8. Compute the distance between two pixels X (3,2), Y(1,1) using three distance methods. CO2-App

9. Compare crisp and fuzzy classifier CO1-U

10. Draw the structure of supervised clustering for image segmentation. CO1-U

PART – C (5 x 16= 80 Marks)

11. (a) Derive the expression for the image formation process in various projections CO1-U (16)

Or

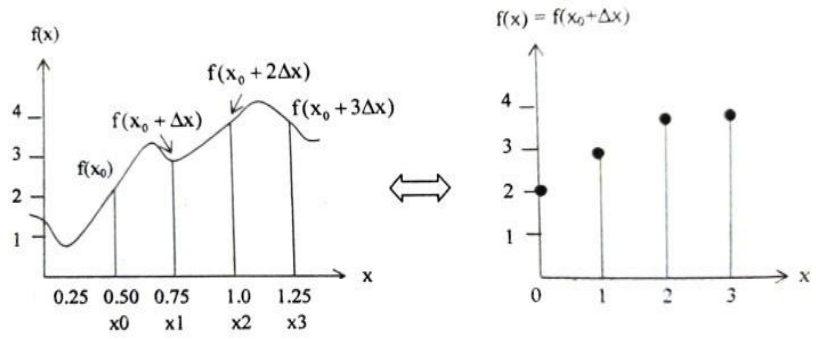
(b) Describe briefly about Inverse Radon transform methods CO1-U (16)
(i) back-projection method
(ii) Fourier transform method

12. (a) Define Histogram equalization of an image. A 3-bit image of size 4×5 is shown below. Compute the histogram equalized image. CO2-App (16)

0	1	1	3	4
7	2	5	5	7
6	3	2	1	1
1	4	4	2	1

Or

(b) Consider the function shown in fig (a) sampling at the argument values x0 = 0.75, x1 = 1, x2 =1.25 and x3 = 1.5 and redefining the argument produces the discrete function in fig Calculate the Fourier spectrum CO2-App (16)

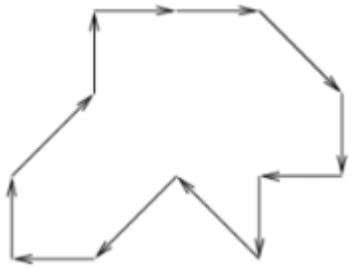


13. (a) Apply Roberts, Sobel and prewitt operators on the pixel(1,1) in the following image and analyze those operators — CO3-App — (16)

50	50	100	100
50	50	100	100
50	50	100	100
50	50	100	100

Or

(b) How image is segmented using chain codes and explain it types. Find the 8-directional chain code and shape number for the figure given below: — CO3-App — (16)



14. (a) Consider a single artificial neuron with weights w1 = 2, w2 = -4 and w3 = 1. Let the activation of the unit is given by: — CO3-App — (16)

$$\varphi(v) = \begin{cases} 1 & \text{if } v \geq 0 \\ 0 & \text{otherwise} \end{cases}$$

Calculate what will be the output value y of the unit for each of the following input patterns:

Pattern	P_1	P_2	P_3	P_4
x_1	1	0	1	1
x_2	0	1	0	1
x_3	0	1	1	1

Or

(b) Identify which method is suitable for classifying and recognizing objects in the images and implement with suitable examples. — CO3-App — (16)

15. (a) Analyze K-Means clustering for image segmentation with a suitable example and compare its performance with Mean shift algorithm — CO5-Ana — (16)

Or

(b) Write Matlab programs for various 2D geometric transformations for changing the orientation of an image and shifting every pixel in the image to a new position. Compare their results. — CO5-Ana — (16)