53 (CS 715) DSIP

2021

DIGITAL SPEECH AND IMAGE PROCESSING

Paper : CS 715

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1. 5×4=20

(a) Explain the importance of low level processing and also their contribution in mid-level processing.

(b) What are the key stages in digital image processing for mid-level processing? Mention the stages with diagram.

(c) Write down the path and boundary relationship among the pixels.

(d) Consider the two image subsets, S_1 and S_2, shown in the following *figure*, for $V = \{1\}$, determine whether these two subsets are (a) 4-adjacent (b) 8-adjacent *or* (c) *m*-adjacent.

	S_1				S_2				
0	0	0	0	0	0	0	1	1	0
1	0	0	1	0	0	1	0	0	1
1	0	0	1	0	1	0	1	0	0
0	0	1	1	1	0	0	0	0	0
0	0	1	1	1	0	0	1	1	1

2. 5×4=20

(a) Calculate the Euclidean distance and city block distance for the pixels *a* and *b* with coordinates (8,10), (10,20) and show in the matrix form.

(b) Describe the different types of adjacencies between two pixels '*p*' & '*q*'.

(c) Explain image sampling and quantization with a diagram.

(d) Write down the derivation for noise reduction with the addition of noisy images.

3. Answer the following : ***(any four)*** 5×4=20

(a) Explain the region growing algorithm with the steps.

(b) Derive the CMY intensity mapping function of equation

$S_i = kr_i + (1-k), i = 1, 2, 3$ from its RGB counterpart in equation $S_i = kr_i, i = 1, 2, 3$.

(c) Explain pattern classes and *three* pattern arrangements with diagram.

(d) Define the similarity tree and similarity matrix with a diagram.

(e) Calculate the decision boundary for the two mean vectors which are $M_1 = (4{\cdot}4, 2{\cdot}4)$ and $M_2 = (6{\cdot}0, 3{\cdot}0)$ of two classes 1 & 2 respectively.

4. Answer the following : ***(any four)*** 5×4=20

(a) Explain JPEG compression.

(b) Compare the various network structure respective to types of decision region.

(c) Explain the metric and topological properties of digital images.

(d) Write down the formulation for converting the colors from RGB to HSI and HIS to RGB.

(e) What is an image information ? How to measure it ?

5. Write down the short notes on the following : ***(any four)*** : 5×4=20

(i) Hole filling

(ii) Image gradient

(iii) String matching in structural methods

(iv) Step in Syntactic Recognition of Strings

(v) Rank filter

6. Differentiate between the following : ***(any four)*** 5×4=20

(i) Erosion and Dilation

(ii) Coding redundancy and spatial/ temporal redundancy

(iii) Luminance and Brightness

(iv) Contrast stretching and Intensity-level Slicing

(v) Thinning *vs* Thickening.