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B. Tech. VIII - Sem. (Main/Back) Exam., June - 2023
Electronics & Comm. Engineering
8EC5-12 Digital Image and Video Processing

Time: 3 Hours

Maximum Marks: 120
Min. Passing Marks: 42

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and four questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1.   NIL _____   2.   NIL _____

PART – A   [10×2=20]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1   What is the meaning of neighbourhood pixels and distance measures? Show it by drawing digital image representation.

Q.2   Discuss briefly about frequency domain filters.

Q.3   Write an expression to represent two dimensional DFT and IDFT.

Q.4   What do you understand by lossless compression?

Q.5   What is the uncertainty principal of Fourier transform?

Q.6   What is the use of Sub – band filter banks?

Q.7 Explain the term thresholding in context to images.

Q.8 What do you understand by image enhancement?

Q.9 Draw 3 x 3 weighted average filter mask used for filtering.

Q.10 What do you mean by inter – frame redundancy in context to video signals?

PART – B   [5×8=40]

(Analytical/Problem solving questions)

Attempt any five questions

Q.1 Discuss the following in context to digital images by taking a suitable example.

(i) Image subtraction

(ii) Image rotation

Q.2 An image clip is formed by using the following six colors with the given relative frequency of occurrence. Apply Huffman lossless coding algorithm to minimize the average code length. Calculate the coding efficiency and write modified code for all the six colors.

White	Red	Yellow	Green	Blue	Orange
0.45	0.12	0.05	0.08	0.2	0.1

Q.3 Apply 3 x 3 mean filter on the bold marked pixels to minimize the image noise.

19	202	33	200	32
34	**255**	25	**0**	26
49	67	47	79	52

Q.4 Discuss digital image acquisition process using CMOS sensors.

Q.5 For the given image, apply the image dilation process by using the 3 x 3 structuring element as shown below –

0	0	0	0	0	0
0	0	1	1	1	0
0	1	1	1	1	0
0	0	1	1	1	0
0	0	0	0	0	0

0	1	0
1	**1**	1
0	1	0

Q.6 Discuss different color models along with their applications.

Q.7 Write a short note on image segmentation.

PART – C [4×15=60]

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any four questions

Q.1 Apply the following image arithmetic operations for the given 8-bit image -

(i) Image Complement (ii) Intensity transformation $y = 2x$, where x is the input image pixel intensity and y is the output image pixel intensity.

105	101	177	168	87
126	18	250	101	35
0	0	56	0	0
100	105	198	0	50
0	0	117	76	0

Q.2 Apply Histogram equalization for enhancing the following 3-bit image.

1	0	2	1	0	0
3	0	2	2	1	1
3	1	3	2	3	2
2	2	1	2	1	3

Q.3   Apply the Laplacian operator for calculating the edge map at the bold pixel
        positions in the following image.

27	37	166	143
183	210	139	159
77	**65**	**43**	171
81	18	180	178
110	199	154	106

Q.4   Discuss about any one lossy image compression standard and write about
        the application of lossy image compression.

Q.5   Discuss briefly about the following terms in context to video signals -
        (i) Motion estimation
        (ii) Object detection and tracking