

Elective - I Digital Image Processing

(3 Hours)

[Total Marks : 80

- N.B. : (1) Question No. 1 is compulsory.
(2) Attempt any three questions from remaining.
(3) All questions carry equal marks.
(4) Assume suitable data wherever necessary.

1. Answer any four of the following:

- (a) Justify the statement "Quality of picture depends on the no: of pixels and the no: of gray levels representing the pictures". 5
(b) Explain RGB color model to represent a digital image. 5
(c) Can two different images have the same histogram? Justify your answer. 5
(d) Define Chain codes in 4-connectivity and 8-connectivity. 5
(e) Compare arithmetic coding and Huffman coding. 5

2. (a) Apply the following Image Enhancement techniques for the given 3 bits per pixel image segment. 10

$$I = \begin{bmatrix} 2 & 1 & 2 & 1 & 0 \\ 7 & 1 & 4 & 3 & 2 \\ 2 & 4 & 1 & 3 & 7 \\ 1 & 3 & 4 & 6 & 3 \\ 1 & 4 & 1 & 3 & 4 \end{bmatrix}$$

- (i) Digital Negative
(ii) Bit plane Slicing
(iii) Thresholding with $T=5$

(b) Perform histogram equalization and plot the histograms before and after equalization. 10

Gray level	0	1	2	3	4	5	6	7
No:of pixels	128	75	280	416	635	1058	820	684

[TURN OVER]

3. (a) Given the 7x7 Image segment, perform dilation using the structuring element shown: 10

Structuring element:

1	0
0	1

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

- (b) Explain image segmentation based on similarity with the help of examples. 10

- 4 (a) A source emits 6 symbols with the following probabilities. Construct the Huffman code and calculate the average code word length and coding efficiency. 10

Symbol	A	B	C	D	E	F
Probability	0.2	0.3	0.06	0.15	0.04	0.25

- (b) Explain with block diagram the transform based coding. 10

5. (a) Check whether the DFT matrix is unitary or not and calculate the 2D-DFT of the given image segment using matrix multiplication method. 10

$$f(x,y) = \begin{matrix} 0 & 0 & 1 & 1 \\ 1 & 2 & 0 & 0 \\ 1 & 0 & 1 & 1 \\ 2 & 0 & 2 & 0 \end{matrix}$$

- (b) Explain various image enhancement techniques in frequency domain. 10

6. Write short notes on any three of the following :- 20

- (a) Hit or Miss Transformation
- (b) Discrete Wavelet Transform
- (c) Thresholding techniques
- (d) Image file formats

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