Image Processing
E1
09/05/08

Con. 3430–08. [REVISED COURSE] **CO–3487**

(3 Hours) **[Total Marks : 100**

N.B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** out of remaining **six** questions.
(3) **Figures** to the **right** indicate **full** marks.
(4) Assume **suitable** data wherever **necessary** and **justify** the same.

1. (a) Consider the image segment shown below :– **5**

	3	1	2	1	(q)
	2	2	0	2	
	1	2	1	1	
(p)	1	0	1	2	

Compute the lengths of the shortest 4, 8 and m-path between p and q.

(b) Explain Morphological thining algorithm. **5**

(c) Justify 'Quality of picture depends on no. of pixels and gray levels'. **5**

(d) Obtain the slant transformation of the image f(x, y) **5**

$$f(x, y) = \begin{bmatrix} 1 & 5 \\ -6 & 7 \end{bmatrix}$$

2. (a) Explain the separability and translation property of Discrete Fourier transform for an image. **10**

(b) The square is represented by co-ordinates (1, 1) (3, 1) (1, 3) and (3, 3). If the square is rotated by 45° clockwise and shifted by 2 units, obtain its new co-ordinates. **10**

3. (a) Gray level histogram of an image is given below **10**

Gray level	0	1	2	3	4	5	6	7
No. of pixels	400	700	1350	2500	3000	1500	550	0

Compute the gray level histogram of the output image obtained by enhancing the input by histogram equalization technique. Draw input, output histogram along with its transfer function.

(b) Apply Prewitt and Laplacian operators on given image segment. Use appropriate threshold. Give output image before and after thresholding. **10**

4. (a) Write first four Walsh sequence of length N = 4. Using these sequences generate sixteen orthogonal Walsh patterns. **10**

(b) Draw and explain block diagram of IPEG Encoder and Decoder. **10**

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5. (a) Generate Huffman code for the given source. Calculate Entropy of the source, average length of code word and Huffman efficiency. **12**

Symbol	a	b	c	d	e	f	g	h
Probability	0·19	0·25	0·21	0·16	0·08	0·06	0·03	0·02

(b) Consider an 8-pixel line of gray scale data as {12, 12, 13, 13, 10, 13, 57, 54} which has been uniformly quantized with 8 bit accuracy. Construct its IGS code. State and explain in brief the type of redundancy which is exploited here to achieve compression. **8**

6. (a) Define opening and closing operations. Perform these operations on following image segment with given structuring element – **10**

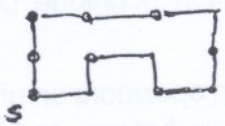
0	1	0	0	0
0	0	1	1	0
0	1	1	0	0
0	0	0	1	0
1	1	0	0	0

Image Segment

1	(1)	1

Structuring Element

(b) For given boundary, compute 4-path chain code find first difference, circular first difference shape number and order of boundary. **10**



7. Write short notes on (any **four**) :– **20**
   (a) Pseudo color Image Processing
   (b) Arithmetic Coding
   (c) Brightness adaptation and discrimination
   (d) Region-oriented segmentation
   (e) Texture
   (f) Moments.