

Image Processing

(3 Hours)

[Total Marks : 100

10-30 to 1-30

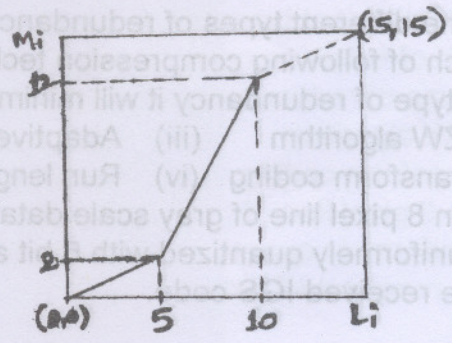
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- N.B. (1) Question No.1 is compulsory.
 (2) Attempt any four questions out of the remaining six questions.
 (3) Assume suitable data if necessary.

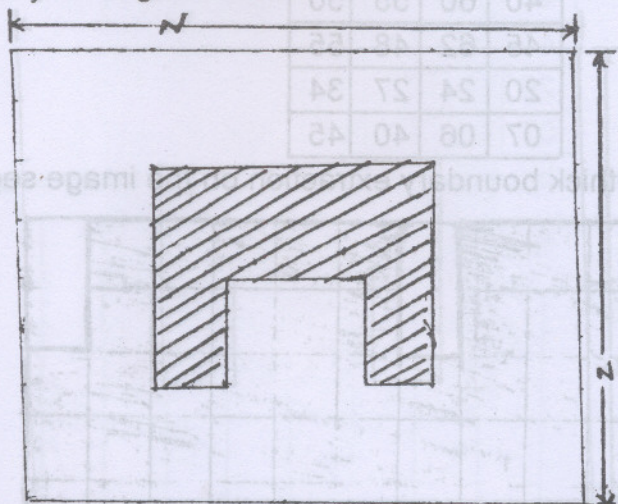
1. Justify/contradict the following statements :— 20
- (a) Laplacian is better than gradient for detection of edges.
 - (b) Histogram is a unique representation of an image.
 - (c) Image enhancement is a subjective operation.
 - (d) Removing interpixel redundancy may or may not result in lossy compression.
 - (e) Image segmentation algorithms generally are based on one of two basic properties of intensity values.

2. (a) A 4×4 image segment is given below :— 10
 Li and Mi are the input and output gray levels

10	3	12	8
11	13	9	6
5	4	9	6
6	10	10	7



- (i) Draw its histogram.
 - (ii) Perform contrast modification as per the transformation function shown in the graph.
 - (iii) Prepare the histogram of new image.
- (b) Segment the image shown by using split and merge procedure. 10
 Let $p(R_i) = \text{TRUE}$ if all pixels in R_i have the same gray level. Show the quadtree corresponding to your segmentation.



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3. (a) List any two properties of 2D-DFT and prove any one of them. 5
 (b) Obtain the Hadamard matrix for $N = 8$ 5
 (c) Calculate the 2D Hadamard transform of the image segment shown below :— 10

2	1	0	1
1	1	2	3
2	4	0	3
1	1	1	1

4. (a) Write a note on Discrete Cosine Transform and its applications in Image Processing. 10
 (b) Define and explain Moments, Normalized moments and Central moments. 10
5. (a) What is Hough Transform ? How it can be used for edge linking ? Explain with the help of an example. 10
 (b) Write DDA algorithm to draw a line. Also explain the basic transformation in Computer Graphics. 10
6. (a) What are the different types of redundancies in digital images ? Explain in brief. Specify each of following compression techniques whether it is lossy or lossless and which type of redundancy it will minimize :— 12
 (i) LZW algorithm (iii) Adaptive Delta Modulation
 (ii) Transform coding (iv) Run length coding.
- (b) Consider an 8 pixel line of gray scale data { 12, 10, 08, 13, 14, 32, 40, 11 } which has been uniformly quantized with 6 bit accuracy. Construct its 3-bit IGS code. Decode the received IGS code. 8

7. (a) A digital image with eight quantization level is given below :— 10

$$f(x,y) = |i - j| \text{ for } i, j = 0, 1, 2, 3, 4, 5, 6, 7$$

Perform histogram equalization. Derive the transformation function and draw histogram.

- (b) Perform Zooming operation using Linear Interpolation as well as Replication, on following image. State method performs generally better :— 5

40	60	55	50
45	62	48	55
20	24	27	34
07	06	40	45

- (c) Perform 1 pixel thick boundary extraction on the image segment given below :— 5

