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SF-7737

B. E. - IV (Sem. VIII) Examination

May / June - 2011

Image Processing

(Elective - II)

Time : **3** Hours] [Total Marks : **100**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ **B. E. - 4 (SEM. 8)**

Name of the Subject :

☛ **IMAGE PROCESSING (ELECTIVE - 2)**

☛ Subject Code No. : **7 7 3 7** ☛ Section No. (1, 2,.....) : **NIL**

Seat No. :

Student's Signature

(2) Attempt all the questions.

(3) Figures to the right indicate marks.

(4) All symbols and abbreviations have their usual meaning.

(5) Assume suitable data, wherever required.

1 (a) Do as directed (two mark each) **10**

(i) What are the steps involved in digital image processing ?

(ii) Define spatial resolution and gray level resolution.

(iii) Explain 4-adjancency with example.

(iv) Find the number of bits required to store a 512 x 512 image with 64 gray levels.

(v) Define image sampling and quantization.

(b) Explain following gray level transformations :

(i) Image Negatives

(ii) Log transformations

(iii) A Power law transformation.

(c) Consider the image segment shown in below figure : **6**

(i) Let V = {0,1} and compute the lengths of the shortest 4-, 8- and m-path between p and q

(ii) Repeat for V = {1,2}

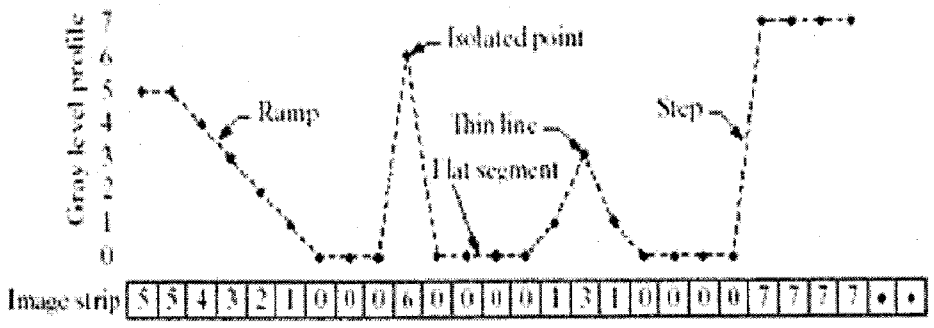
3	1	2	1(q)
2	2	0	2
1	2	1	1
1(p)	0	1	2

2 (a) Define histogram and Do histogram equalization on the 5×5 image with integer intensities in the range between one and eight : **7**

1	8	4	3	4
1	1	1	7	8
8	8	3	3	1
2	2	1	5	2
1	1	8	5	2

(b) Explain first derivative of enhancement using gradient operator. Derive the appropriate mask for it. **7**

2 (a) In below figure simplified 1-D horizontal gray level profile of an image center is shown. Find out the first and second derivative and comment on it. **7**



(b) Explain about Histogram specification with necessary derivations. **7**

3 Attempt any two : 14

(a) Discuss Image smoothing with the following

(i) Low pass spatial filtering

(ii) Median filtering

(b) Explain basics of filtering in the frequency domain

(c) Prove that when $(-1)^{\wedge(x+y)}$ is multiplied with F (x,y) then it will shift the origin of F (x,y) to the frequency coordinates (M/2, N/2)

(d) Explain homomorphic filtering in detail.

4 (a) Do as directed (two mark each) 10

(i) Give the difference between image enhancement and image restoration

(ii) What do you mean by inter pixel redundancy.

(iii) How an image restoration process is modeled ?

(iv) Write equation of PDF for uniform noise.

(v) Define opening and closing operation in morphological image processing.

(b) Explain Wiener filtering for removal of blur in image. 7

(c) Estimate the image degradation function using mathematical modeling. 5

5 (a) (i) Define coding redundancy, inter pixel redundancy and Psycho-visual Redundancy in detail. 7

(ii) An 8-level image has the gray level distribution shown in below table. Where code 1 represents the natural 3-bit binary code whereas code 2 represents variable length coding, calculate the average number of bits required to code the image, compression ratio and redundancy.

r_k	$Pr(r_k)$	Code-1	Code-2
0	0.19	000	11
1/7	0.25	001	01
2/7	0.21	010	10
3/7	0.16	011	001
4/7	0.08	100	0001
5/7	0.06	101	00001
6/7	0.03	110	000001
1	0.02	111	000000

(b) Explain an importance of erosion operation with necessary example. **7**

OR

5 (a) Define LZW coding and encode following 4×4, 8-bit image of vertical edge and calculate the compression ratio. **7**

39	39	126	126
39	39	126	126
39	39	126	126
39	39	126	126

(b) Explain terms : **7**

(i) Skeleton of image and

(ii) Convex hull

6 Attempt any two : **14**

(a) Lossless predictive coding

(b) One dimensional and two dimensional run length coding

(c) Hit or Miss transformation

(d) Thinning and Thickening