B.E. Sem 7 (Rev.) Etrx. Image Processing 29/12/08

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Con. 5721–08. (REVISED COURSE) RC–7247

(3 Hours) [Total Marks : 100

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

1. State **True** or **False** and justify (Answer any **five**) :– **20**
   (a) All image compression techniques are invertible.
   (b) Laplacian is not a good edge detector.
   (c) Runlength coding is a loss less coding but may not give data compression always.
   (d) The principal operation of mediun filter is to force points with distinct intensities to be more like their neighbours.
   (e) Second pass of Histogram Equalization will produce exactly the same result as the first pass.
   (f) The sum of coefficients of High pass mask should be one.

2. (a) Differentiate between spatial and tonal resolution. **4**
   (b) Can variable length coding procedure be used to compress histogram equalized image with 2^n gray levels ? Explain. **6**
   (c) A digital image with eight levels of quantization has its gray level distribution as shown below **10**

Gray levels	0	1	2	3	4	5	6	7
No. of Pixels	200	170	110	80	60	80	140	160

Perform Histogram Equalization and draw original and equalized histograms.

3. (a) Apply Low Pass and High Pass spatial mask on the following image matrix. **10**
Prove that Highpass = Original – Lowpass. Assume Virtual Rows and Columns :

$f(x, y) =$

30	31	32
33	120	30
32	32	31

   (b) Perform edge detection using graph theoretic technique for the image segment shown below. Assume that edge starts in the first row and ends by third row. **10**

$f(x, y) =$

7	5	2
1	2	4
2	4	3

Find the edge corresponding to minimum cost path.

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4. (a) Compute Haar basis functions for N = 8 and write the corresponding Haar Matrix. **8**

(b) Compute Hadamard transform for the sequence $f = [1\ 0\ 2\ 3\ 4\ 1\ 3\ 1]^t$. Draw the butterfly diagram. **8**

(c) Explain the following properties of Image Transforms : **4**

(i) Symmetrical

(ii) Orthogonal.

5. (a) A source emits six symbols with probabilities as shown below **10**

$a_1 \rightarrow 0{\cdot}22$, $a_2 \rightarrow 0{\cdot}09$, $a_3 \rightarrow 0{\cdot}19$, $a_4 \rightarrow 0{\cdot}32$, $a_5 \rightarrow 0{\cdot}12$, $a_6 \rightarrow 0{\cdot}06$.

Generate the Huffman code and calculate Entropy, average length and coding efficiency.

(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 and obtain RMS signal to noise ratio. **10**

6. (a) Explain point operation and spatial operation as applied to digital images. **6**

(b) Explain segmentation based on discontinuity and segmentation based on similarities. **8**

(c) Classify with reasons the following data compression techniques into lossy and lossless schemes : **6**

(i) Constant Area Coding

(ii) IGS Coding

(iii) LZW Coding.

7. Write short notes on (any **four**) :– **20**

(a) Derivative Filters

(b) Hough Transform

(c) Transform Coding

(d) Homomorphic Filtering

(e) K–L Transform

(f) Lossy and Lossless Compression.