53 (EC 714) DIPR

2013

(May)

DIGITAL IMAGE PROCESSING

Paper : EC 714

Full Marks : 100

Pass Marks : 30

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1. *(a)* Explain 'Sampling Theorem' for two dimensional image processing.

   (b) What are the practical limitations of sampling and reconstruction? Explain briefly. 10+10

2. *(a)* State the advantages of non uniform quantization over uniform quantization. 5

   (b) Explain how decision level and reconstruction levels are decided in optimum mean square or Max LLoyd Quantizer. 10

(c) Write the mathematical expression of two dimensional convolution. An $(M_1 \times N_1)$ image is convolved with $(M_2 \times N_2)$ image. What would be the dimension of convolved image? 5

3. (a) What are the advantages of seperable transfrom? Under what condition a transfrom is said to be seperable? 7

(b) For a given orthogonal matrix $A = \frac{1}{\sqrt{2}}\begin{bmatrix} 1 & -1 \\ 1 & 1 \end{bmatrix}$ and a given image $U = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$, what is the transformed image? 7

(c) What are advantages of *FFT* over *DFT*. 6

4. (a) Describe seperability property of *2D* Fourier transfrom. Write the forward equation of the Fourier transform, *DCT*, Discrete Hadamard transfrom. 10

(b) Perfrom *FFT* operation of the following one dimensional sequence

$x(n) = [4\ 3\ 2\ 1]$ 10

5. *(a)* What is meant by histogram equalization? Explain how histogram equalization is done. 10

(b) What is mean and median filtering of image? Explain difference between mean filtering and weighted average mean filter. 10

6. *(a)* What are the different methods to estimate degradation function? Explain briefly. 10

(b) Explain what is Run Length Coding in image compression. Prove that in run length coding compression factor is

$$C = \frac{1 - P^m}{m(1 - P)}$$ where P is

the probablity of occurrence of symbol *1* in binary image. M is provided as maximum run length. 10

7. Write short notes on : ***(any two)*** 10×2

(a) K-L Transfrom
(b) Homomorphic filter
(c) Winner filter
(d) Huffman coding
