1 : 1st half-12-(Con-4668)JP

Con. 4668-12. (REVISED COURSE) GN-9086

(3 Hours) [Total Marks : 100]

N.B. (1) Question No. 1 is **compulsory**.

(2) Attempt any **four** questions out of remaining **six** questions.

(3) Assume **suitable** data wherever **required** and clearly **specify** it.

1. Attempt any **four** questions :— 20

(a) Find the energy of the signal $x(n) = \left(\frac{1}{2}\right)^n u(n) + 8^n u(n-1)$

(b) Prove that two dimensional DFT matrix is an unitary matrix.

(c) What do you understand by negative of image ?

(d) Show that Highpass = Original − Lowpass

(e) Give five different classifications for system in Digital Signal Processing with examples.

(f) Compare analog and digital filters.

2. (a) Find linear convolution of given two sequences :— 4
   $X[n] = \{1, 2, 3, 4\}$
   $h[n] = \{1, -1\}$

(b) For sequence : 6

$$x_1(n) = \cos\left(\frac{2\pi}{N}\right)n$$

$$x_2(n) = \sin\left(\frac{2\pi}{N}\right)n$$

Determine N point, circular convolution $x_1(n)\textcircled{N}x_2(n)$.

(c) A particular digital image with eight quantization levels has following histogram. 10
Perform histogram equalization and give new equalized histogram.

Grey level	0	1	2	3	4	5	6	7
No. of pixels	200	270	130	60	60	80	140	160

(a) What is Morphology ? Name and explain the basic operations in morphology. 10

(b) For the 3 bit 4 × 4 size image perform following operations :— 10

(i) Negative

(ii) Thresholding with T = 4

(iii) Intensity level slicing with background $r_1 = 2$ and $r_2 = 5$

(iv) Bit plane slicing for MSB and LSB plane

(v) Clipping with $r_1 = 2$ and $r_2 = 5$

1	2	3	0
2	4	6	7
5	2	4	3
3	2	6	1

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4. (a) Design a Butterworth filter using Bilinear Transformation method with following **10**
         specification :
         Ap = 3db As = 15db Wp = 0.5π Ws = 0.75π Fs = 1Hz
    (b) Explain the method of segmentation of images by region splitting and merging. **10**

5. (a) Explain with example the following :—   **10**
              (i)   Thinning
              (ii) Hit or Miss transformation.
    (b) Find 8 point DFT using DIT FFT algorithm with butterfly diagram for   **10**
              X(n) = {1, −1, −1, −1, 1, 1, 1, −1}

6. (a) Differentiate between the following (any **two**) :—   **10**
              (i)   Convolution Vs Correlation
              (ii)   Bit plane slicing Vs Grey level slicing
              (iii) Low pass filter Vs Median filter.
    (b) Write note on Discrete Cosine transform and it application find DCT of given image. **10**

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

7. Write short note (any **four**) :—   **20**
         (a) Digital Water Marking
         (b) Biometric Authentication
         (c) Lossy Image Compression
         (d) Content based Image Retrival
         (e) Text Compression
         (f) Hadamard Transform
         (g) Vector Quantization.