

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SECOND SEMESTER M.TECH DEGREE EXAMINATION, DECEMBER 2017

Electronics and Communication Engineering
(Signal Processing)

01EC6304- Digital Image Processing

Max.Marks: 60

Duration: 3 hours

Answer any two questions from each Section

SECTION-A (2×9)

- I. (a) State and explain 2-D Sampling Theorem for band limited images. (4)
(b) The image $f(x, y) = 4 \cos 4\pi x \cdot \cos 6\pi y$ is ideally sampled with $\Delta x = \Delta y = 0.5$ and the samples are passed through an ideal LPF with bandwidth $\left[\frac{1}{2\Delta x}, \frac{1}{2\Delta y} \right]$. What is the reconstructed image? (5)

- II. For the 2×2 transform A and the image U, $A = \begin{bmatrix} \sqrt{3}/2 & 1/2 \\ -1/2 & \sqrt{3}/2 \end{bmatrix}$ and $U = \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$, calculate the transformed image V and the basis images. Also represent the original image in terms of basis images. (9)

- III. (a) For the image segment $I = \begin{bmatrix} 2 & 2 \\ 1 & 3 \end{bmatrix}$, compute the transform coefficients using
i. DFT
ii. Haar Transform (4)
(b) Explain Homomorphic Filtering. (5)

SECTION-B (2×9)

- IV. (a) Define the following
i. Point Spread function (PSF)
ii. Circulant matrices
iii. Block Circulant matrices (3)
(b) Explain Image Segmentation using Region Growing. (6)
V. Explain DCT based JPEG Image Compression standard. What are the advantages of JPEG-2000 standard over JPEG? (9)
VI. (a) What are the basic steps in Canny Edge Detection Algorithm? (3)
(b) Derive an expression for the frequency response of 2-D Discrete Wiener filter used for Image Restoration. (6)

(P.T.O)

SECTION-C (2×12)

VII. (a) State and prove Fourier-Slice theorem. (4)

(b) Explain the following Morphological Algorithms

- i. Hole Filling
- ii. Thickening
- iii. Pruning (8)

VIII. Derive an expression for Inverse Radon Transform and hence derive the Convolution Back-Projection Algorithm. <http://www.ktuonline.com> (12)

IX. (a) Prove the following duality relations in Mathematical Morphology.

$$(i) (A \ominus B)^c = A^c \oplus \hat{B} \quad (ii) (A \circ B)^c = A^c \bullet \hat{B} \quad (6)$$

(b) Explain the following Morphological operations.

- i. Closing
- ii. Opening
- iii. Hit-or Miss Transform (6)

<http://www.ktuonline.com>

Whatsapp @ 9300930012

Your old paper & get 10/-

पुराने पेपर्स भेजे और 10 रुपये पायें,

Paytm or Google Pay से