

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
SIXTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), MAY 2019

Course Code: EC370

Course Name: Digital Image Processing

Max. Marks: 100

Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks

Marks

- 1 a) With a neat diagram explain the working of a Vidicon camera tube. (6)
- b) Explain the terms (i) Mach-band effect, (ii) Saturation (iii) 8 - adjacency (6)
- c) List the properties of distance functions. (3)
- 2 a) Write the recursive definition of a Hadamard Transform. Using this definition construct a 4 x 4 Hadamard matrix. (4)
- b) Bring out the structural difference between circulant and Toeplitz matrices. Write an example for each. (4)
- c) What is Singular value decomposition? Explain how each factor in SVD can be found out? (7)
- 3 a) State and prove the 2-D Sampling theorem. (6)
- b) Write the Forward and inverse transformation kernels for 2D-DFT. Are these kernels separable? Justify your answer. (5)
- c) Suppose the eigen vectors of covariance matrix of the 2-dimensional data are $e_1 = \begin{pmatrix} 1/\sqrt{2} \\ 1/\sqrt{2} \end{pmatrix}$ and $e_2 = \begin{pmatrix} 1/\sqrt{2} \\ -1/\sqrt{2} \end{pmatrix}$ respectively. If the mean vector of data is zero, find the KL transform of the data point $x = \begin{pmatrix} 2 \\ 0 \end{pmatrix}$ (4)

PART B

Answer any two full questions, each carries 15 marks

- 4 a) List and describe any two point processing operations with necessary graphs. (5)
- b) Consider the following image of size 5x5. It has gray level values from 0-7. (10)
Perform the histogram equalization of the image and obtain the final image.

5	5	5	5	5
3	5	7	5	3
3	7	7	7	3
3	5	7	5	3
5	5	5	5	5

- 5 a) Differentiate between constrained and unconstrained restoration. (3)
- b) Explain the image degradation and restoration model. (4)
- c) With appropriate equations, explain the issue with inverse filtering for restoring the image. How Wiener filtering eliminates the issue? (8)
- 6 a) Explain the smoothing of images in frequency domain using (i) ideal low pass filters and (ii) Butterworth low pass filters. (5)
- b) Explain the terms unsharp masking and high-boost filtering. (5)
- c) How the separation of illumination and reflectance components is achieved in homomorphic filtering? (5)

PART C

Answer any two full questions, each carries 20 marks

- 7 a) Explain the Region splitting and merging approach for image segmentation. (6)
- b) Differentiate between local, global and adaptive thresholding. (6)
- c) How Hough transform is helpful in edge linking? (8)
- 8 a) What are the basic data redundancies exploited in image compression? Explain. (8)
- b) Compare the transforms DCT and KLT as a choice for image compression application. (4)
- c) Explain the concept of Arithmetic coding. (8)
- 9 a) Explain any one clustering algorithm for image segmentation. (8)
- b) Perform Huffman coding for the following set of symbols. (8)

Symbol	Probability
A	0.2
B	0.1
C	0.05
D	0.6
E	0.05

- c) Name and draw any two types of spatial masks used for edge detection. (4)
