

Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
SIXTH SEMESTER B.TECH DEGREE EXAMINATION, APRIL 2018

**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) State and explain the 2D sampling theorem. Explain how aliasing errors can be eliminated?  | (7) |
|   | b) Define the terms brightness, contrast, hue and saturation with respect to a digital image. | (4) |
|   | c) Explain the terms False contouring and Mach band effect.                                   | (4) |
| 2 | a) Perform KL transform on the following matrix.  | (8) |

$$x = \begin{bmatrix} 4 & -2 \\ -1 & 3 \end{bmatrix}$$

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|---|--|-----|
|   | b) State and prove the convolution property of 2D DFT.                             | (7) |
| 3 | a) Compute the 2D DFT of matrix $x = \begin{bmatrix} 4 & 6 \\ 3 & 4 \end{bmatrix}$ | (7) |
|   | b) Find the DCT of the sequence $x(n) = \{11, 22, 33, 44\}$ .                      | (4) |
|   | c) Explain the energy compaction property of DCT.                                  | (4) |

**PART B**

*Answer any two full questions, each carries 15 marks.*

- |   |   |     |
|---|---|-----|
| 4 | a) What is meant by histogram equalization of an image? Explain how histogram equalization can be performed on a given gray scale image, with necessary mathematical details. | (7) |
|   | b) Distinguish between image enhancement and image restoration. Give an example for each.   | (4) |
|   | c) What are the steps involved in homomorphic filtering?  | (4) |
| 5 | a) Distinguish between smoothing and sharpening filters. Give the appropriate masks for any one smoothing and sharpening filters.   | (8) |

- b) Explain the image restoration mechanism using a Weiner filter. (7)
- 6 a) Explain how a degraded image can be restored using an inverse filter. Explain its limitations. (7)
- b) Explain any two geometric transformations on an image. (4)
- c) Explain how low pass filtering can be performed using frequency domain method. (4)

### PART C

*Answer any two full questions, each carries 20 marks.*

- 7 a) Explain the method of global thresholding for image segmentation. (6)
- b) What is Laplacian of an image? Derive an appropriate mask for the Laplacian operator. Explain how Laplacian can be used for detecting edges in an image. (9)
- c) What is a LoG filter? Give an appropriate mask for a LoG filter. (5)
- 8 a) Explain the active contour algorithm for image segmentation. (8)
- b) Explain how lines can be detected using Hough transform. (7)
- c) Compare the image compression standards JPEG and MPEG. (5)
- 9 a) Explain the different steps in dictionary based compression algorithm. (7)
- b) Explain the use of wavelet transforms in image compression. (7)
- c) Illustrate Huffman coding with an example. (6)

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