4C.

MANIPAL INSTITUTE OF TECHNOLOGY MANIPAL A Constituent Institution of Manipal University

SEVENTH SEMESTER B.Tech. (E & C) DEGREE END SEMESTER EXAMINATION **NOV/DEC 2017 SUBJECT: DIGITAL IMAGE PROCESSING (ECE - 4006)**

Reg. No.

TIME: 3 HOURS

Instructions to candidates

- Answer ALL questions. • Missing data may be suitably assumed.
- 1A. Illustrate the fundamental steps in digital image processing.
- What does the standard deviation of a histogram tell us about the image? Comment on the image 1B. characteristics given by the following gray level image histograms.



1C. Find the block Toeplitz matrix to perform the linear convolution between x[m,n] and h[m,n]: $x[m,n] = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ h[m, n] = [1]

(5+3+2)

MAX. MARKS: 50

- 2A. What is a unitary transform? Check whether the DFT matrix is unitary or not. Also, discuss the property of energy compaction of a unitary transform and give reasons why this property is useful in image processing.
- 2B. What is image filtering? What will we obtain if the arithmetic mean filter is applied to an image repeatedly? What will happen if we use the median filter instead?
- 2C. Draw and discuss Haar scaling and Haar wavelet functions.

(5+3+2)

(5+3+2)

- 3A. Explain different stages of the Canny edge detector. Also, compare the Canny edge detector with the LoG edge detector.
- 3B. Briefly explain the image smoothing and sharpening operations in the spatial domain.
- 3C. What is the advantage of separable filters? Show that a 2D Gaussian is separable.
- ⁹⁴₉₇] matrix using DPCM without quantizer. Draw and explain the transmission and reception of the $\begin{bmatrix} 92\\ 91 \end{bmatrix}$ 4A. Also, compare the DPCM-based image compression technique against the transform-based image compression technique.
- 4B. Segment the given arbitrary shape by the quadtree approach.

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What is quantization? What is the role of quantization matrix in	JPEG compression

(5+3+2)

- 5A. Distinguish Watermarking from Cryptography with the help of necessary diagrams. What is the need for digital watermarking? List the advantages of performing watermarking in the frequency diagram.
- 5B. What is a hit-or-miss transform? Also, express the region filling operation mathematically.
- Obtain the Huffman code for the word COMMITTEE 5C.

(5+3+2)

