## MANIPAL INSTITUTE OF TECHNOLOGY

A Constituent Institution of Manipal University

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## SEVENTH SEMESTER B.TECH. (E & C) DEGREE END SEMESTER EXAMINATION DECEMBER 2018 SUBJECT: DIGITAL IMAGE PROCESSING (ECE - 4006)

Reg. No.

## TIME: 3 HOURS

0 1 0

1 0 1 MAX. MARKS: 50

Instructions to candidates

- Answer ALL five full questions.
  Missing data may be suitably assumed.
- 1A. Use the Hit or Miss transform to identify the location of the following shape pixel configuration in the image below using the two structuring element B1 and B2.

<b>B1</b>			Image										
1	0		0	0	0	0	0	0	0	0	0	0	0
1	1		0	0	1	0	0	0	0	0	0	0	0
1	0		0	0	1	0	0	1	1	1	1	0	0
I		1	0	1	1	1	0	0	0	0	0	0	0
B2			0	0	1	0	0	0	0	1	1	0	0
0	1		0	0	0	0	1	0	0	1	1	1	0
0	0		0	0	0	1	1	1	0	0	1	0	0
0	1		0	0	0	0	1	0	0	0	0	0	0
			0	0	0	0	0	0	0	0	0	0	0

Shape							
0	1	0					
1	1	1					
0	1	0					

1B. Find first and second order derivative on the following gray level profile as shown below.



Discuss the significance of the derivative on edge detection.

1C. Estimate the Haar transformed coefficient for the 2X2 sub\_image:

Calculate the 4-point 2D DCT for the following sub-image:

245	247
234	231

(4+3+3)

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

2A.

- 2B. With a neat block diagram describe the applications of image processing in real time problems.
- 2C. Show that the average value of the Laplacian of Gaussian operator is zero.

(4+3+3)

- 3A. Write the fundamental steps involved in digital image processing. Describe the basic relationship between the steps.
- 3B. Describe image sampling and quantization.
- 3C. Write the result of median filter of 3 X 3 mask for given sub image.

1	4	5	8
0	1	14	11
0	8	7	9
1	2	0	3
		( 1	

(4+3+3)

4A. A Gaussian low pass filter in the continuous frequency domain has the transfer function.

$$H(u,v) = Ae^{\frac{-(u^2+v^2)}{2\sigma^2}}$$

Show that the corresponding filter in the spatial domain has the following form

$$h(t,z) = A2\pi\sigma^2 e^{-2\pi^2\sigma^2(t^2+z^2)}$$

4B. Encode the message BILL GATES using Arithmetic coding for the given probability distribution.

Symbol	SP	Α	В	E	G	Ι	L	S	Т
Probability	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1

4C. With a neat diagram explain analysis and synthesis filters of wavelet transformation

(4+3+3)

5A. Perform the histogram specification for the given image and histogram desired as shown below:



- 5B. Explain region based image segmentation. With a neat example describe split and merge technique
- 5C. i. Differentiate between gray level slicing and bit plane slicing.
  - ii. Obtain the expression for the optimal global adaptive thresholding.

(4+3+3)