

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL (A constituent unit of MAHE, Manipal)

## SIXTH SEMESTER B.TECH. (PME) DEGREE END SEMESTER EXAMINATION APRIL/MAY 2019 SUBJECT: VIDEO PROCESSING (ECE - 3202)

## **TIME: 3 HOURS**

MAX. MARKS: 50

## Instructions to candidates

- Answer **ALL** questions.
- Missing data may be suitably assumed.
- 1A. Find the transform of mapping the pixels from x to y using Histogram specification. Given that  $x_i = y_i$ ; i = 0 to 7 and the input probability density function

$$p_r(x_i) = \begin{cases} \frac{x_i}{12} & i = 0, 1, 2, 3\\ \frac{|7 - x_i|}{12} & i = 4, 5, 6, 7 \end{cases}$$

The output probability density function is:  $p_s(y_i) = \frac{y_i}{28}$ 

- 1B. Explain the Digital video codec with motion estimation and compensation.
- 1C. Write the result of an averaging filter with 3 X 3 mask for given sub image.

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

(4+3+3)

(4+3+3)

2A. Encode the message, **I MEET U** using arithmetic coding procedure.

Symbol	U	Е	Ι	Т	space	М
Probability	0.2	0.3	0.1	0.2	0.1	0.1

2B. Illustrate the morphological method to extract the boundary of the following object. (A;Object B: Structuring element).



2C Find the first and second order derivative on the following gray level profile as shown below. Discuss the significance of the derivative on edge detection.



- 3A. With a neat diagram explain H.264 coding and decoding system.
- 3B. Compare MPEG-1 and MPEG-2 in terms of bit rate and application.
- 3C. Define the followings:
  - a. Spatial scalability
  - b. Temporal scalability
  - c. SNR scalability

(4+3+3)

4A. Perform the motion estimation and compensation between the current and the reference frame as shown in the below table. (Current block is highlighted as bold and italic).

Reference frame				
9	0	5	1	8
2	6	8	6	0
0	2	5	0	3
7	9	8	2	3
6	7	9	0	5

Current frame				
3	0	5	1	8
1	4	9	2	6
1	9	5	7	0
1	6	3	2	0
7	1	9	7	9

- 4B. With a neat diagram, explain the fundamental steps in Digital Image Processing.
- 4C. Describe the transmission order and syntax hierarchy in MPEG-1 standards.

(4+3+3)

5A. Find the Fourier transform, H(u,v) of this mask in the frequency domain.

$$h = \begin{bmatrix} 0 & 0 & -1 & 0 & 0 \\ 0 & -1 & -2 & -1 & 0 \\ -1 & -2 & 16 & -2 & -1 \\ 0 & -1 & -2 & -1 & 0 \\ 0 & 0 & -1 & 0 & 0 \end{bmatrix}$$
 What type of filter is this, LPF, BPF or HPF?

- 5B. Show that, subtracting the laplacian from an image is proportional to unsharp masking.
- 5C. With a neat block diagram, explain video codec system with prediction.

(4+3+3)