Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

SIXTH SEMESTER B.TECH. (PME) DEGREE END SEMESTER EXAMINATION
JUNE 2019
SUBJECT: VIDEO PROCESSING (PMT - 3202)

TIME: 3 HOURS **MAX. MARKS: 50**

Instructions to candidates

- Answer **ALL** questions.
- Missing data may be suitably assumed.

1A. Explain Digital video system in terms of video capture, sampling, display and colour space.

1B. Estimate the pixel value in the question marked position by performing the spatial mean filters.

Example: *Vertical edge*

0	0	9	9	9
0	0	9	9	9
0	0	9	18	9
0	0	9	9	9
0	0	9	9	9

Filtered using a 3x3 mean filter:

1/9	1/9	1/9
1/9	1/9	1/9
1/9	1/9	1/9

0	0	9	9	9
0	?	?	?	9
0	?	?	?	9
0	?	?	?	9
0	0	9	9	9

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1C. Assuming continuous intensity values suppose that an image has the intensity PDF $p(r) = \frac{2r}{(L-1)^2}$ for r between 0 to L-1 and $p(r) = 0$ for other values for r. Find the transformation function that will produce an image whose intensity PDF is $p(z) = \frac{3z^2}{(L-1)^3}$ for all z and $p(z) = 0$ for other values of z.

(4+3+3)

2A. Explain following piecewise linear transformation:

a. Contrast Stretching b. Gray–level slicing c. Image subtraction

2B. Find the connectivity between p and q as shown below with set V = {1, 2}. Write the minimum distance between p and q for all (4, 8 and m) connectivity.

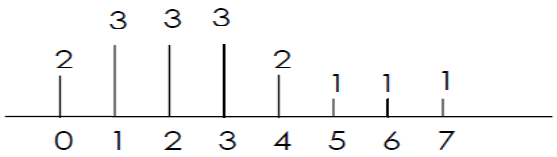
$$\begin{matrix} 3 & 1 & 2 & 1^{q} \\ 2 & 2 & 0 & 2 \\ 1 & 2 & 1 & 1 \\ {}_{p}1 & 0 & 1 & 2 \end{matrix}$$

2C Explain Hough Transform.

(4+3+3)

3A. With a neat diagram explain JPEG-base line codec system.

3B. Illustrate the concept of histogram specification for the following sub-image with 4X4 matrix of a 3 bit image and the specified histogram as shown below:



0	0	0	4
1	1	1	5
1	2	2	7
2	2	2	7

3C. Write an algorithm to perform three step search motion estimation for video processing.

(4+3+3)

4A. Determine the motion vector for the given sub image of 3X3 size within the reference frame of size 5X5.

Current block		
9	0	3
2	6	7
0	1	4

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

4B. i. Differentiate between gray level slicing and bit plane slicing.

ii. Obtain the expression for the optimal global adaptive thresholding.

4C. Give the mask used for high boost filtering.

(4+3+3)

5A Write the coding and decoding algorithm for arithmetic coder and perform the arithmetic coding for the below given message GATES BILL

Symbol	space	A	B	E	G	I	L	S	T
Probability	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1

5B. With a neat diagram, explain fundamental steps in Digital Image Processing.

5C. Describe inter frame coding in the MPEG-1 architecture.

(4+3+3)