Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

SEVENTH SEMESTER BTECH. (E & C) DEGREE END SEMESTER EXAMINATION
JANUARY/FEBRAURY 2021
SUBJECT: DIGITAL IMAGE PROCESSING (ECE - 4006)

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

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

1A. Let A denote the set shown shaded in the **Figure. 1A**. Refer to the structuring element shown. Sketch the result of the following morphological operation.

i. A eroded B4 dilated with B2

ii. A eroded B1 dilated with B3

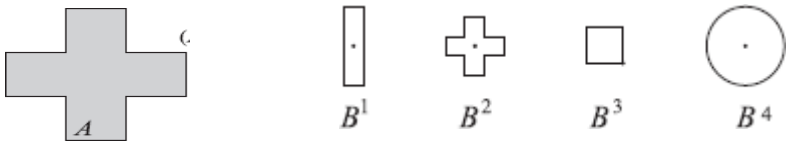


Figure. 1A

1B. Perform High Boost filter for the given Gray level profile with Boosting factor 'A" as 10. Show the results in the graphical representation.

7	7	7	7	6	5	4	3	2	1	1	1	1	1

(5+5)

2A. i. Show that the average value of the Laplacian of Gaussian operator is zero.

ii. Image 'A', has been degraded by the channel noise at the position (C3, R4). Choose suitable window/kernel to filter the image with required operation to retrieve the image.

	C1	C2	C3	C4	C5	C6	C7
R1	72	79	76	81	89	78	75
R2	79	77	90	89	76	56	78
R3	69	87	45	90	56	76	78
R4	71	91	4	78	76	66	76
R5	90	89	76	56	54	68	76
R6	56	90	87	98	76	67	89
R7	79	77	90	89	78	90	90

2B. Laplacian of Gaussian (f(x, y)) for 5x5 size window is defined below. Perform 2D Fourier Transform on f(x, y).

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

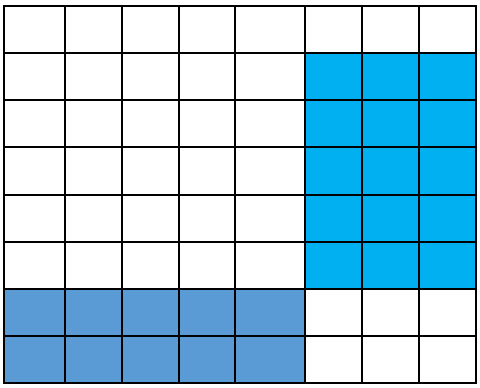
(5+5)

3A. Transmitter (T), transmits the Image 'A' to the receiver. During the transmission channel noise is added to the signal 'A', results with signal 'B'. Perform the suitable transformation on the noisy signal 'B' to retrieve the original signal 'A'.

A				
1	0	7	5	0
6	2	3	4	6
0	7	1	5	4
3	4	1	0	0
7	3	4	5	6

B				
1	0	0	5	0
6	2	3	4	1
0	1	1	5	4
3	4	1	0	0
1	3	4	5	1

3B. Write the steps to perform the split and merge technique. Perform the split and merge operation for the given sub-image for the coloured section.



(5+5)

4A. Define 4-8 and m- adjacency. Compute the lengths of the shortest 4- 8- and m- path between p and q in the image segment as shown below by considering V= {2, 3, 4}. Point p and point q.

2	2	4	6	5	0	3	4(q)
1	0	5	6	2	3	4	2
3	0	5	1	2	3	5	6
7	0	6	5	4	3	0	0
7	6	1	2	4	5	6	0
0	6	5	7	3	4	5	1
1	0	0	3	4	5	6	5
4	3	2(p)	1	3	4	5	5

4B. Perform the transformation task on the given time domain coefficient as per the JPEG Image coding standards. (Coloured Pixels)

56	34	55	62
59	67	64	59
67	49	69	64
68	66	61	64

(5+5)

5A. Encode the message ELECTRONIC using Arithmetic coding for the given probability distribution.

Symbol	E	L	C	T	R	O	N	I
Probability	.2	.1	.2	.1	.1	.1	.1	.1

5B. i. Consider a 3X3 spatial mask that averages the four closest neighbors of a point (x, y), but excludes the point itself from the average, find the equivalent filter H(u, v) in the frequency domain. Show that the result is a low pass filter.

ii. Explain the followings:

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

(5+5)