DHARMSINH DESAI UNIVERSITY, NADIAD
FACULTY OF TECHNOLOGY
B.TECH CE SEMESTER - VII
SUBJECT: (CE – 714) IMAGE PROCESSING

Examination	**:**	**Second Sessional**	**Seat No**	**:**	_____
Date	**:**	**06/10/2020**	**Day**	**:**	**Tuesday**
Time	**:**	**10:00 to 11:15**	**Max Marks**	**:**	**36**

INSTRUCTIONS:
1. Figures to the right indicate maximum marks for that question.
2. The symbols used carry their usual meanings.
3. Assume suitable data, if required & mention them clearly.
4. Draw neat sketches wherever necessary.

Q.1 Do as Directed **[12]**

(a) State and prove translation property of 2-D Discrete Fourier Transform. **[2]**

(b) State the statement as true or false: "The Gaussian Low-pass Filter achieves more smoothing than the Butterworth Low-pass Filter of order 2 for the same value of cutoff frequency". Justify your answer. **[2]**

(c) What is moirè pattern? How to reduce it? **[2]**

(d) List the basic conditions that must be fulfilled during image segmentation. **[2]**

(e) How to compute gradient angle image? What kind of information is obtained form it? What is indicated by constant intensity areas in gradient angle image? **[2]**

(f) Describe image partitioning method of variable thresholding. **[2]**

Q.2 Answer the following questions (Any Two) **[12]**

(a) 1. Prove that the dc term, *F (0, 0)*, of a DFT is proportional to the average value of its corresponding spatial image. Assume that image is of size MxN. Suppose that you pad the image with zeros to size PxQ. Let *Fp (0, 0)* denote the dc term of the DFT of the padded function. What is the ratio of the average values of the original and padded images? Is *Fp(0,0)=F(0,0)?* Support your answer mathematically. **[3]**

2. Give frequency domain formulations of Unsharp Masking, Highboost Filtering, and High- Frequency-Emphasis Filtering. **[3]**

(b) What are the objectives of canny's approach of edge detection? Discuss the steps of the canny edge detection algorithm in detail. **[6]**

(c) Use region growing method to segment the object. The seed of the image is center of the image. The region is grown when the difference between two pixel is less than or equal to 5. What will be the segmentation if region is grown in horizontal and vertical directions? What will be the segmentation if region is grown in horizontal, vertical and diagonal directions? **[6]**

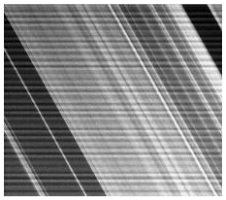
10	10	10	10	10	10	10
10	10	10	60	70	10	10
59	10	60	64	59	56	60
10	59	10	**60**	70	10	62
10	60	59	65	67	10	65
10	10	10	10	10	10	10
10	10	10	10	10	10	10

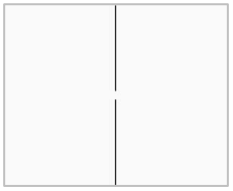
Q.3 Attempt the following questions **[12]**

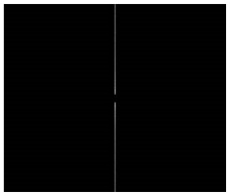
a) Determine the IDFT for the following DFT sequence, X(k) = {10, -2 + 2*i*, -2, -2 - 2*i*} **[4]**

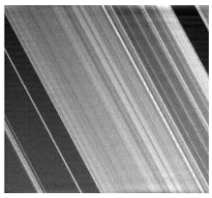
b) The following image is enhanced using different filters in frequency domain. First row shows the different filters used. Which output image in the second row corresponds to each filter in **[2]**

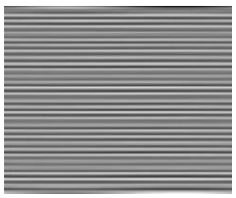
the first row? Discuss reason for your selection.


Original Image


Filter A


Filter B


Output: 1


Output: 2

c) Find threshold for the given 6x6 image using otsu's method also show the output image after thresholding. **[6]**

0	0	1	4	4	5
0	1	3	4	3	4
1	3	4	2	1	3
4	4	3	1	0	0
5	4	2	1	0	0
5	5	4	3	1	0

OR

Q.3 Attempt the following questions **[12]**

a) Find out the convolution of two rectangular function *f* and *h*. Both are defined in the range 0 to 4. Show the calculation. **[6]**

$$f(x): \quad \begin{cases} \frac{1}{2} & 0 < x < 2 \\ 0 & \text{Elsewhere} \end{cases}$$

$$h(y): \quad \begin{cases} \frac{1}{3} & 0 < y < 3 \\ 0 & \text{Elsewhere} \end{cases}$$

Now consider that both the functions are periodic with period T=4. What will be the impact of periodicity on this convolution?

b) Write a regional processing algorithm for edge linking to find a polygonal fit to open and closed curves. Apply the algorithm for finding a polygonal fit to the given set of points, P, shown in figure below. Assume that the points belong to the closed curve. Point A and B are selected to be the leftmost and rightmost points in P, respectively. Assume that the threshold, T is approximately equal to 1.5 subdivisions in the figure grid. **[6]**