Name: Enrolment No:	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2019

Programme Name: B.Tech- ASEA **Semester : VII**
Course Name : Digital Image Processing **Time : 03 hrs**
Course Code : ECEG 3016 **Max. Marks : 100**
Nos. of page(s) : 02
Instructions:

SECTION A
All the questions in this section are compulsory

S. No.		Marks	CO
Q 1	Develop a procedure for computing the median of an $n \times n$ neighborhood. Propose a technique for updating the median as the center of the neighborhood is moved from pixel to pixel.	5	CO1
Q 2	Image enhancement is a process of manipulating an image so that the result is more suitable than the original for specific application, what are the three types of piecewise-linear functions most widely used for image enhancement.	5	CO1
Q 3	Consider two 8- bit images whose intensity levels span the full range from 0 to 255. a. Discuss the limiting effect of repeatedly subtracting image 2 with the image 1 b. Assume that the result is represented also in eight bits.	5	CO2
Q 4	The median ξ of a set of numbers is such that half the values in the set are below ξ and the other half are above it. For example, the median of the set of values {2, 3, 8, 20, 21, 25, 30} is 20. Show that an operator that computes the median of a sub image area, S is nonlinear.	5	CO3

SECTION B
Answer all the questions in this section are compulsory

Q 5	What is the difference between frequency and spatial domain?	10	CO1
Q 6	Assume that you have to process a digital Image. List the step wise process to do the processing. What will be the different tools and components of image processing system? Explain with the help of example and diagram.	10	CO2

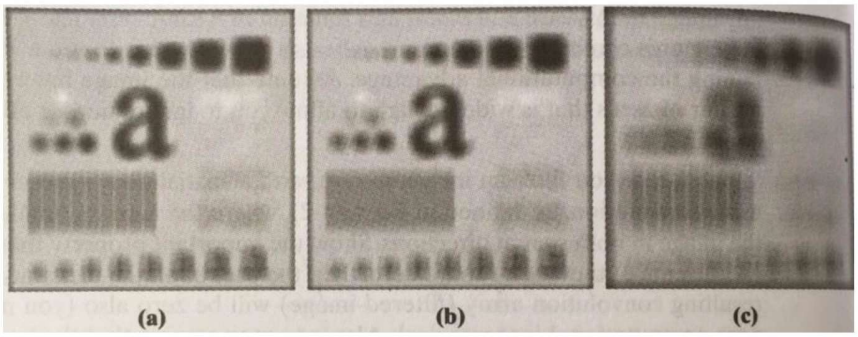
Q 7	Discuss the limiting effect of repeatedly applying *3x3* low pass spatial filters to a digital image. You may ignore border effects. Is this effect different from applying a *5x5* filter? Develop a MATLAB program for creating a Low pass filter where the masks can be extended upto *32 X 32*. Or The following tables give the number of pixels at each of the grey levels (a) (b) in an image with those grey values only. In each case draw the histogram corresponding to these grey levels, and then perform a histogram equalization and draw the resulting histogram.	**10**	**CO3**
Q 8	In a given application an averaging mask is applied to input images to reduce noise, and then a laplacian mask is applied to enhance small details. Would the result be the same if the order of these operations were reversed?	**10**	**CO4**
	SECTION-C **Answer any two**		
Q 8	Two images f(x,y) and g(x,y) have histograms h_f and h_g. Give the conditions under which you can determine the histograms of a) f(x,y)+g(x,y) b) f(x,y)-g(x,y) c) f(x,y)Xg(x,y) d) f(x,y)/g(x,y)	**20**	**CO2**
Q9	An Automobile manufacturer is automating the placement of certain components on the bumpers of the limited-edition line of sports cars. The components are color coordinated, so the robots need to know the color of each car in order to select the appropriate bumper component. Models come only in four colors: blue, green, red and white. You are hired to propose a solution based on imaging. How would you solve the problem of automatically determining the color of each car., keeping in mind the cost is the most important consideration in your choice of components?	**20**	**CO4**

(a)

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
20	40	60	75	80	75	65	55	50	45	40	35	30	25	20	30

(b)

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	0	40	80	45	110	70	0	0	0	0	0	0	0	0	15

Q 10	The three images shown below were blurred using square averaging masks of sizes n = 23, 25 and 45 respectively. The vertical bars on the left lower part of (a) and (c) are blurred, but a clear separation exists between them. However, the bars have merged in image (b), in spite of the fact that the mask and that produced this image is significantly smaller than the mask that produced image (c). Explain the reason for this.  (a) (b) (c)	**20**	**CO4**