

Name:

Enrolment No:



UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2019

Course: Digital Image Processing
Program: B.Tech CSE+ALL
Course Code: GIEG 323

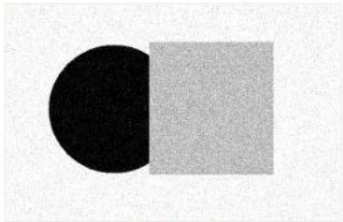
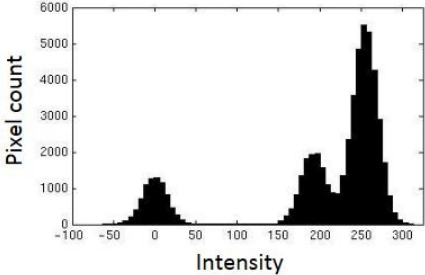
Semester: VI
Time: 03 hrs.
Max. Marks: 100



Instructions:

SECTION A

S. No.		Marks	CO
Q 1	Briefly describe a Simple Image Formation Model.	4	CO1
Q 2	Differentiate between Sampling and Quantization with example.	4	CO1
Q 3	Write down short notes on Fourier series.	4	CO2
Q 4	Define pattern. Write short notes on Pattern Recognition System.	4	CO5
Q 5	Describe the importance of morphological operations in DIP. List down the applications of this concept.	4	CO4

SECTION B

Q 6	<p>Suppose we have an input image and their corresponding histogram:</p> <div style="display: flex; justify-content: space-around; align-items: center;"><div style="text-align: center;"><p>Input image</p></div><div style="text-align: center;"><p>Pixel count</p><p>Intensity</p></div></div> <p>How we segment the objects in given image?</p>	10	CO2
Q 7	Explain image degradation model /restoration process in detail with diagram. Also list down few applications based on this.	8+2=10	CO3
Q 8	The image in Fig. b) is obtained by convolving the image in Fig. a) with a 3×3 convolution mask. Which of the following masks could have been used to give this processing result? Explain it.	10	CO3

	<p>a) $H_1 = \frac{1}{9} \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix};$</p> <p>b) $H_2 = \frac{1}{8} \begin{bmatrix} -1 & -1 & -1 \\ -1 & 8 & -1 \\ -1 & -1 & -1 \end{bmatrix};$</p> <p>c) $H_3 = \frac{1}{4} \begin{bmatrix} 0 & -1 & 0 \\ -1 & 4 & -1 \\ 0 & -1 & 0 \end{bmatrix};$</p> <p>d) $H_4 = \frac{1}{4} \begin{bmatrix} 1 & 0 & -1 \\ 2 & 0 & -2 \\ 1 & 0 & -1 \end{bmatrix}.$</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>a)</p> </div> <div style="text-align: center;">  <p>b)</p> </div> </div>		
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Q 9	<p>Illustrate the removal of noises in a digital image? Write down the steps of filtering in frequency domain.</p> <p style="text-align: center;">OR</p> <p>Analyze the importance of histogram. Explain histogram equalization for the purpose of enhancement the quality of an image</p>	10	CO2
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SECTION-C

Q 10	<p>For the following image A =</p> <pre> 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1 0 0 0 0 1 1 1 1 0 0 1 1 1 1 1 1 0 0 1 1 1 1 1 1 0 0 1 1 1 1 0 0 0 0 1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 </pre> <p>And structuring element B =</p> <pre> 1 1 1 1 1 1 1 1 1 </pre> <p>Calculate and show the results of the following morphological operations</p> <ol style="list-style-type: none"> Erosion of A with B Dilation of A with B Opening of A with B Closing of A with B 	4x5=20	CO4
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Q 11	<p>The speed of a bullet in flight is to be estimated by using high-speed imaging techniques. The method of choice involves the use of a TV camera and flash that exposes the scene for K seconds the bullet is 3 cm long, 1 cm wide, and speed of bullet is 1000m/sec. The camera optics produce an image in which the bullet</p>	20	
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	<p>occupies 10% of the horizontal resolution of a 256 x 256 digital image.</p> <p>a) Calculate the maximum value of K that will guarantee that the blur from motion does not exceed 1 pixel. (8 M)</p> <p>b) Calculate the minimum number of frames per second that would have to be acquired in order to guarantee that at least two complete images of the bullet are obtained during its path through the field of view of the camera. (12 M)</p> <p style="text-align: center;">OR</p> <p>a) Discuss thresholding in image segmentation? Explain different thresholding techniques in DIP.</p> <p>b) Explain chain code algorithm and differentiate between the chain code for a triangle and a rectangle in 10 x 10 resolution sample image.</p>		CO5
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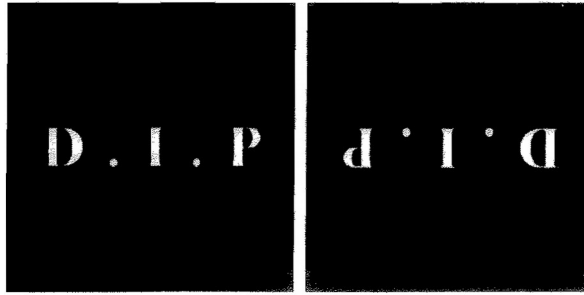
Instructions:

SECTION A

S. No.		Marks	CO
Q 1	Discuss and differentiate between Computer Vision and DIP. Write down the important components of image formation model.	4	CO1
Q 2	Write down the different distance measurement formula used in digital images among the pixels.	4	CO1
Q 3	How DFT is useful in digital image processing? Write down the equations.	4	CO2
Q 4	Describe the importance of morphological operations in DIP. List down the applications of this concept.	4	CO4
Q 5	Discuss the concept of convolution and how it impact on digital images.	4	CO2

SECTION B

Q 6	Discuss thresholding in image segmentation? Explain thresholding localization.	4+6=10	CO3
Q 7	Illustrate the removal of noises from a digital image? Write down the steps of filtering in frequency domain.	3+7=10	CO2
Q 8	Explain chain code algorithm and differentiate between the chain code for a triangle and a rectangle.	10	CO5
Q 9	Discuss a model of Image Degradation/Restoration process. Illustrate the different noise models using diagram with respective probability density functions. OR Consider the image shown in figure. The image on the right was obtained by (a) multiplying the image on the left by $(-1)^{x+y}$, (b) computing the DFT, (c) taking the complex conjugate of the transform, (d) computing the inverse DFT, and (e) multiplying the real part of the result by $(-1)^{x+y}$. Explain mathematically and discuss why the image on the right appears it does. Write down the algorithm.	10	CO3



SECTION-C

Q 10	Illustrate and analyze image segmentation. List down image segmentation algorithms. Discuss thresholding technique for image segmentation.	8+2+10= 20	CO5
Q 11	<p>For the following image A =</p> <pre> 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1 0 0 0 0 1 1 1 1 0 0 1 1 1 1 1 1 0 0 1 1 1 1 1 1 0 0 1 1 1 1 0 0 0 0 1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 </pre> <p>And structuring element B =</p> <pre> 1 0 0 0 0 0 0 0 1 </pre> <p>Calculate and show the results of the following morphological operations</p> <ol style="list-style-type: none"> Erosion of A with B Dilation of A with B Opening of A with B Closing of A with B <p style="text-align: center;">OR</p> <p>(a) Suppose a square object was eroded by a circle whose radius was about one quarter the side of the square. Draw the result.</p> <p>(b) Analyze and explain the importance of morphological operation in digital image. List down the application of this concept in real life.</p>	20	CO4

