UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, April/May 2018

Course: Machine Vision (MEEL 461)   Semester: VIII
Program: B.Tech Mechatronics
Time: 03 hrs.   Max. Marks: 100

 Instructions:

SECTION A
Note: All 5 questions are compulsory. Each question of Section A carries 4 marks.

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	Define image compression. How it is useful for different organization like facebook, twitter and others?	4	CO3
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
Note: Answer all the questions. Each question of section B carries 10 marks.

Q 6	Discuss thresholding in image segmentation? Explain different thresholding techniques.	10	CO3
Q 7	Illustrate the removal of noises from a digital image? Write down the steps of filtering in frequency domain.	10	CO2
Q 8	Explain Bay's Theorem. Discuss how it is useful for classification purpose with example.	10	CO5
Q 9	Suppose a square object was eroded by a circle whose radius was about one quarter the side of the square. Draw the result. OR Explain chain code algorithm and differentiate between the chain code for a triangle	10	CO4

	and a rectangle.		CO5

Q 10	Analyze and differentiate with example between:
	    a) Spatial and Frequency Domain Filter
	    b) Erosion and Dilation
	    c) Lossy and Lossless Compression
	    d) Smoothing and Sharpening
		4x5=20	CO1, CO3

Q 11	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 occupies 10% of the horizontal resolution of a 256 x 256 digital image.
	
	    (a) Calculate the maximum value of K that will guarantee that the blur from motion does not exceed 1 pixel. (8M)
	
	    (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. (12M)
	
	    OR
	
	    i) Discuss redundancy. Analyze and explain Image Compression Model with diagram. (10M)
	
	    ii) Find the Huffman code for the following: (10M)
	    P(A)=0.2, p(B)=0.1, p(C)=0.2,p(D)=0.05,p(E)=0.3,p(F)=0.05,p(G)=0.1
	    Calculate the following :
	    a) Average Length b) Entropy c) Efficiency d) Redundancy
		20	CO2
			
			CO3

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, April/May 2018

Course: Machine Vision (MEEL 461)   **Semester: VIII**
Program: B.Tech Mechatronics
Time: 03 hrs.   **Max. Marks: 100**

Instructions:

SECTION A
Note: All 5 questions are compulsory. Each question of Section A carries 4 marks.

S. No.		Marks	CO
Q 1	Define digital image. Briefly explain the fundamental steps in Digital Image Processing.	4	CO1
Q 2	Discuss why image filtering is done in the frequency domain? What is spatial filtering? What are the various spatial filtering approaches for image enhancement?	4	CO2
Q 3	Define noise in digital image and how it can affect image quality? Briefly explain the different noise probability density functions in digital image processing.	4	CO2
Q 4	Discuss different types of redundancies available in the images? Why we Image Compression. Briefly explain the Image Compression Model.	4	CO3
Q 5	Define image compression. How it is useful for different organization like facebook, twitter and others?	4	CO3

SECTION B
Note: Answer all the questions. Each question of section B carries 10 marks.

S. No.		Marks	CO
Q 6	Define Image Segmentation. Discuss and explain the Region-Based Segmentation Algorithm.	10	CO4
Q 7	Searching based on images features is an active area of research. What different features of an image that can be classified? Discuss different image filters available and help in searching the image for a particular domain.	10	CO3
Q 8	Describe the techniques used for image smoothing. Write about various edge detectors available algorithms.	10	CO2
Q 9	Define redundancy. Analyze and explain Image Compression Model with diagram. OR Suppose a square object was eroded by a circle whose radius was about one quarter the side of the square. Draw the result.	10	CO4 CO5

SECTION-C

Note: Answer the questions. Each question of Section C carries 20 marks.

| Q 10 | 1. For the following image A =
    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
And structuring element B =
    1 0 0
    0 0 0
    0 0 1
Calculate and show the results of the following morphological operations
    a). Erosion of A with B
    b). Dilation of A with B
    c). Opening of A with B
    d). Closing of A with B | 4x5=20 | CO5 |
| Q 11 | 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 occupies 10% of the horizontal resolution of a 256 x 256 digital image.
  a) Calculate the maximum value of K that will guarantee that the blur from motion does not exceed 1 pixel.
    (8 M)
  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)

OR

 Discuss and differentiate: (5x4M)
 i)   Clustering and Classification
 ii)   MPEG and JPEG
 iii)   Sampling and Quantization
 iv)   Local and Global Thresholding | 20 | CO1

CO3, CO5 |