UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2022
Program Name: BTECH CSE + (AIML, CSF, GG, CCVT, CSF, BDATA)   **Semester   : V**
Course Name   : Image Processing and Pattern Analysis   **Time   : 3 Hours**
Course Code   : CSEG3041P   **Max. Marks : 100**
Nos. of page(s)   : 2
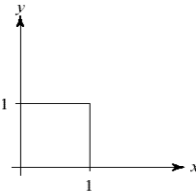
SECTION A

S. No.		Marks	CO
Q 1	Briefly describe a Simple Image Formation Model.	**4**	**CO1**
Q 2	Define unmask sharpening. Write different steps used.	**4**	**CO1**
Q 3	Write the set of morphological operations to extract the boundary on a binary image.	**4**	**CO2**
Q 4	What is the kernel's role in the support vector machine (SVM) classifier? Give one example of a kernel used in SVM.	**4**	**CO4**
Q 5	Discuss filter to find out second-order derivative of an image with example.	**4**	**CO2**

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

Q 6	Consider the image shown below; Compute the equalized image with eight possible gray levels. Show each step carefully. Draw the histograms of the original and equalized images as well as the equalization transformation. 	**10**	**CO1**
Q 7	Find out the Fourier transform of a box function (as shown in Fig) of width T. 	**10**	**CO3**
Q 8	Define convolution and correlation. Some 1-D signal f is given, apply the 1-D convolution and correlation operations on f using filter w where **f= 0 0 0 1 1 0 0** and **w= 1 2 3 4 5.**	**4+6**	**CO3**

Q 6 image:

1	2	1	1	2	0
0	1	5	1	0	1
1	6	7	6	1	2

Q 9	Why affine transformations are used in image processing? Apply the rotation (by 45 degree anti-clockwise) transformation on the image given below and show the transformed image with new coordinates. 	4+6	CO3

SECTION-C

Q 10	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 1 1
	1 1 1
	1 1 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	CO2

Q 11	Discuss the following algorithms with all steps involved.
	   a) HOG
	   b) SHIFT
	   c) Otsu's Thresholding
	OR
	a) Discuss the problem of image segmentation? Explain two thresholding techniques with example. .
	b) Discuss different steps involve in Canny edge detector with focus on hysteresis thresholding and non-maxima suppression.
		6+6+8
		OR
		10+10
			CO4