

Name:  
Enrolment No:



**UNIVERSITY OF PETROLEUM AND ENERGY STUDIES**

**End Semester Examination, December 2022**

**Program Name:** BTECH CSE + (AIML, CSF, GG, CCVT, CSF, BDATA)  
**Course Name :** Image Processing and Pattern Analysis  
**Course Code :** CSEG3041P  
**Nos. of page(s) :** 2

**Semester :** V  
**Time :** 3 Hours  
**Max. Marks :** 100

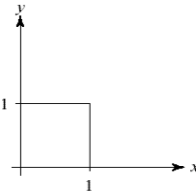
**SECTION A**

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	<p>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.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td>1</td><td>2</td><td>1</td><td>1</td><td>2</td><td>0</td></tr> <tr><td>0</td><td>1</td><td>5</td><td>1</td><td>0</td><td>1</td></tr> <tr><td>1</td><td>6</td><td>7</td><td>6</td><td>1</td><td>2</td></tr> </table>	1	2	1	1	2	0	0	1	5	1	0	1	1	6	7	6	1	2	10	CO1
1	2	1	1	2	0																
0	1	5	1	0	1																
1	6	7	6	1	2																
Q 7	<p>Find out the Fourier transform of a box function (as shown in Fig) of width T.</p>	10	CO3																		
Q 8	<p>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 <b>f= 0 0 0 1 1 0 0</b> and <b>w= 1 2 3 4 5</b>.</p>	4+6	CO3																		

<p>Q 9</p>	<p>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.</p> 	<p>4+6</p>	<p>CO3</p>
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**SECTION-C**

<p>Q 10</p>	<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"> <li>Erosion of A with B</li> <li>Dilation of A with B</li> <li>Opening of A with B</li> <li>Closing of A with B</li> </ol>	<p>4x5=20</p>	<p>CO2</p>
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<p>Q 11</p>	<p>Discuss the following algorithms with all steps involved.</p> <ol style="list-style-type: none"> <li>HOG</li> <li>SHIFT</li> <li>Otsu's Thresholding</li> </ol> <p style="text-align: center;"><b>OR</b></p> <ol style="list-style-type: none"> <li>Discuss the problem of image segmentation? Explain two thresholding techniques with example.</li> <li>Discuss different steps involve in Canny edge detector with focus on hysteresis thresholding and non-maxima suppression.</li> </ol>	<p>6+6+8 OR 10+10</p>	<p>CO4</p>
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