


Name:	 UPES <small>UNIVERSITY WITH A PURPOSE</small>
Enrolment No:	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
Online Examination, May 2021

Course: Digital Image Processing
Program: B. Tech. (CSE) GG
Course Code: CSEG 3001

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

SECTION A

1. Each Question will carry 5 Marks


2. Instruction: Complete the statement / Select the correct answer(s)

Q1	<p>In an image compression standard, 16384 bits are used to represent a 128X128 image with 256 gray levels. What is the compression ratio for the system?</p> <p>a. 4 b. 8 c. 12 d. 16</p>	CO3
Q2	<p>For finding lines at angle 45 degree, we use mask of values</p> <p>a. [-1 -1 -1; 2 2 2; -1 -1 -1] b. [2 -1 -1; -1 2 -1; -1 -1 2] c. [-1 2 -1; -1 2 -1; -1 2 -1] d. [-1 -1 2; -1 2 -1; 2 -1 -1]</p>	CO1
Q3	<p>Intensity levels in 8-bit image are</p> <p>a. 128 b. 255 c. 256 d. 512</p>	CO2
Q4	<p>Equation that describes the hue is</p> <p>a. $H = H-90$ b. $H = H-100$ c. $H = H-120$ d. $H = H-180$</p>	CO4
Q5	<p>What is the set of pixels of 8-neighbors of pixel p at coordinates (x, y)?</p> <p>a. (x+1, y), (x-1, y), (x, y+1), (x, y-1), (x+2, y), (x-2, y), (x, y+2), (x, y-2) b. (x+1, y), (x-1, y), (x, y+1), (x, y-1), (x+1, y+1), (x+1, y-1), (x-1, y+1), (x-1, y-1) c. (x+1, y+1), (x+1, y-1), (x-1, y+1), (x-1, y-1), (x+2, y+2), (x+2, y-2), (x-2, y+2), (x-2, y-2) d. (x+2, y), (x-2, y), (x, y+2), (x, y-2), (x+2, y+2), (x+2, y-2), (x-2, y+2), (x-2, y-2)</p>	CO2
Q6	<p>Two pixels p and q having gray values from V, the set of gray-level values used to define adjacency, are m-adjacent if:</p> <p>a. q is in $N_4(p)$ b. q is in $ND(p)$ and the set $N_4(p) \cap N_4(q)$ has no pixels whose values are from V c. Any of the mentioned d. None of the mentioned</p>	CO2

SECTION B

1. Each question will carry 10 marks

2. Instruction: Write short / brief notes

<p>Q7</p>	<p>For the following gray scale image shown below, compute the degree of the compression that can be achieved using (a) Huffman coding of pixel values, (b) run-length coding, assuming 2 bits to represent the pixel value and the 2 bits to represent the run length.</p> <table border="1"> <tr><td>3</td><td>3</td><td>3</td><td>2</td></tr> <tr><td>2</td><td>3</td><td>3</td><td>3</td></tr> <tr><td>3</td><td>2</td><td>2</td><td>2</td></tr> <tr><td>2</td><td>1</td><td>1</td><td>0</td></tr> </table> <p style="text-align: center;">OR</p> <p>Consider an image strip of size 50 X 100 shown below. The image consists of five vertical stripes. The gray levels of the stripes from left to right are 128, 64, 32, 16 and 8. The corresponding widths of stripes are 35, 30, 20, 10 and 5 pixels respectively. If this stripe image is coded by Huffman coding, determine compression ratio.</p> 	3	3	3	2	2	3	3	3	3	2	2	2	2	1	1	0	<p>CO2</p>									
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<p>Q8</p>	<p>What is the role of histogram equalization in image enhancement? Given an image with 3-bits per pixel, with the following histogram, a) find the histogram mapping table, and b) the resulting histogram after histogram equalization.</p> <table border="1"> <thead> <tr> <th>Gray Level</th> <th>Number of Pixels</th> </tr> </thead> <tbody> <tr><td>0</td><td>5</td></tr> <tr><td>1</td><td>5</td></tr> <tr><td>2</td><td>10</td></tr> <tr><td>3</td><td>20</td></tr> <tr><td>4</td><td>5</td></tr> <tr><td>5</td><td>5</td></tr> <tr><td>6</td><td>0</td></tr> <tr><td>7</td><td>0</td></tr> </tbody> </table>	Gray Level	Number of Pixels	0	5	1	5	2	10	3	20	4	5	5	5	6	0	7	0	<p>CO3</p>							
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<p>Q9</p>	<p>Find the effect of following filters over center (Bold and underlined) pixel in 3 X 3 neighborhoods.</p> <p>(i) Mean Filter (ii) Median filter (iii) Max, Min (iv) Mid Point filter (v) Alpha trimmed filter with d=3</p> <table border="1"> <tr><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td></tr> <tr><td>2</td><td>3</td><td>0</td><td>0</td><td>2</td></tr> <tr><td>2</td><td>3</td><td><u>5</u></td><td>1</td><td>2</td></tr> <tr><td>2</td><td>7</td><td>2</td><td>1</td><td>2</td></tr> <tr><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td></tr> </table>	2	2	2	2	2	2	3	0	0	2	2	3	<u>5</u>	1	2	2	7	2	1	2	2	2	2	2	2	<p>CO4</p>
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<p>Q10</p>	<p>Discuss image dilation and erosion morphological operation. Assume a structuring element of size d/2 is used to dilate and erode a square image of size d. Calculate the size of dilated and eroded images?</p>	<p>CO4</p>																									

Q11	What do you meant by colour model? Explain CMY colour model. Write equations to convert RGB colour model to CMY colour model.	CO1
<p>Section C</p> <p>1. Each Question carries 20 Marks.</p> <p>2. Instruction: Write long answer.</p>		
Q12	<p>What do you mean by image segmentation? Discuss the first and second derivative approach of edge detection. What is the role of zero crossing in case of second derivative?</p> <p style="text-align: center;">OR</p> <p>Draw the functional block diagram of document image processing system and explain the purpose of each block in designing an Optical Character Recognizer (OCR) for document written in Devanagari Lipi.</p>	CO3