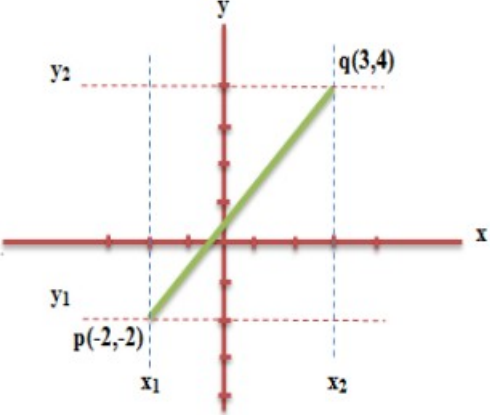| Name: Enrolment No:	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2022

Course: Digital Image Processing   Semester: VI
Program: B.Tech. CS-GG   Time   : 03 hrs.
Course Code: CSEG 3001   Max. Marks: 100

Instructions: Answer Precisely.

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Define binary, grayscale and color images.	4	CO2
Q 2	Discuss different distance measures between two pixels in an image. Calculate Euclidean distance between point p and q. 	4	CO1
Q 3	Why median filter is better than mean filter for reducing noise in an image?	4	CO3
Q 4	Perform point operation over given image with pixel intensity values: I = <table><tr><td>4</td><td>3</td><td>5</td><td>2</td></tr><tr><td>3</td><td>6</td><td>4</td><td>6</td></tr><tr><td>2</td><td>2</td><td>6</td><td>5</td></tr><tr><td>7</td><td>6</td><td>4</td><td>1</td></tr></table>Consider threshold T=4.	4	CO1
Q 5	What are the purposes of defining color models? State some color models available.	4	CO4

SECTION B
(4Qx10M= 40 Marks)

Q 6	Explain key stages in digital image processing with short explanation.	10	CO1

	OR Explain different components of digital image processing system in detail.		
Q 7	Binary dilation and erosion are two primitive operators, which may be used to define other morphological operations. (a) Explain how binary erosion is performed. (b) Explain how binary dilation is performed. (c) A={(0,1),(1,1),(2,1),(2,2),(3,0)} B={(0,0),(0,1)} Perform binary erosion of A by B	10	CO4
Q 8	Define image segmentation. Differentiate gradient and Gaussian edge detection operators with example.	10	CO2
Q 9	Generate the Shannon fano code for all the letters/numbers for given data. Calculate number of compressed bits, entropy, average length and efficiency of code words.	10	CO3

Symbol (x)	A1	A2	A3	A4	A5	A6
Probability of occurrence of x in message $P(x_i)$	0.15	0.25	0.30	0.12	0.10	0.08

SECTION-C
(2Qx20M=40 Marks)

Q 10	i. What are the different types of redundancy that may occur in a digital image? Categorize image compression techniques based on different types of redundancy. ii. Explain JPEG image compression technique with all its components.	20	CO3
Q 11	Apply histogram equalization on the input image of 8_8 below. Let the input and output gray levels be in the range of [0, 7].	20	CO2

1	1	5	5	0	0	1	0
1	1	2	2	0	1	0	1
1	7	6	6	5	5	0	0
0	7	6	7	5	5	5	5
4	7	6	7	3	5	7	0
1	1	4	1	6	5	6	1
2	2	4	1	1	5	1	1
1	2	2	0	0	0	0	5

OR
Answer following questions
i. What is the use of smoothing spatial filters in preprocessing stage?
ii. List different categories of smoothing filter. Explain any one in detail

with kernel. iii. What are the types of blur usually occurred in image processing? Explain different image quality measures (IQMs) proposed to evaluate imaging systems and image coding/processing techniques.		