Reg.No.:												

VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 60008

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – NOV. / DEC. 2024
Seventh Semester
Computer Science and Engineering
U19ITV35 – DIGITAL IMAGE PROCESSING
(Regulation 2019)

Time: Three Hours | Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

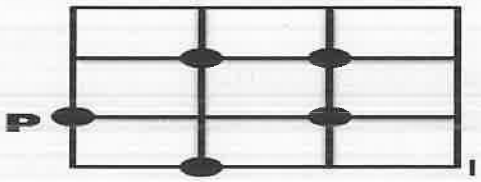
PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	Define the blind spot in the human eye.	2	K1	CO1
2.	Find the distance D_4 between the pixels P and Q in the given image segment	2	K2	CO1

4	3	5	1 (Q)
3	4	1	4
1	5	2	3
2 (P)	1	1	4

3.	Sketch the histogram plot of the image $f(x,y)=\begin{bmatrix}0 & 1 & 1\\ 1 & 2 & 3\\ 2 & 3 & 3\end{bmatrix}$	2	K1	CO2
4.	Compare the frequency response characteristics of Butterworth image smoothing and Gaussian image smoothing filters.	2	K2	CO2

5.	Apply a 3×3 mean filter to the image $f(x,y)=\begin{bmatrix}1 & 4 & 5\\ 6 & 7 & 2\\ 2 & 3 & 2\end{bmatrix}$ and compute the central pixel value of f(x, y).	2	K3	CO3
6.	Infer the effects of dilation and erosion operations.	2	K2	CO3
7.	Sketch the sub-band coding structure.	2	K1	CO4
8.	Define the compression ratio.	2	K1	CO4
9.	Determine the 8- directional chain code sequence from P for the given image. 	2	K2	CO5
10.	How many Fourier coefficients (minimum) are needed to reconstruct a 64-point Fourier series with a square boundary into a circular boundary?	2	K1	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.		Questions	Marks	KL	CO
11.	a)	Draw and explain a simplified cross-section of the human eye.	13	K2	CO1
		(OR)			
	b)	Discuss the basic concepts of image sampling and quantization.	13	K2	CO1
12.	a)	Explain how image enhancement in the spatial domain can be achieved using smoothing operators.	13	K2	CO2
		(OR)			
	b)	Illustrate how to blur and sharpen images in the frequency domain using Ideal, Butterworth, and Gaussian filters.	13	K2	CO2
13.	a)	Demonstrate the Wiener filtering technique used for image restoration and specify its advantages over inverse filtering.	13	K2	CO3
		(OR)			
	b)	Summarize the principle of the following region-based segmentation procedures: (i) Region growing, (ii) Region splitting and merging.	13	K2	CO3
14.	a)	Infer how wavelets and multiresolution techniques can be used in the image compression process.	13	K2	CO4

(OR)

	b)	Illustrate the concept of lossless and lossy predictive coding techniques used in image compression.	13	K2	CO4
15.	a)	Infer the chain code, polygonal approximation and signature in detail.	13	K2	CO5

(OR)

	b)	Write short notes on the following: i. Fourier descriptors ii. Regional descriptors and topological features.	13	K2	CO5

PART – C

(1 x 15 = 15 Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	Apply a 3x3 mean filter and a 3x3 median filter to determine the resultant image matrix. Assume zero-padding at the borders.	15	K3	CO3

80	78	75	75	74	70
83	81	78	77	55	75
86	84	81	100	75	72
88	85	80	80	77	77
0	86	82	82	79	78
88	87	85	10	79	76

(OR)

	b)	Apply the histogram equalization technique to compute new gray levels for the images shown below.	15	K3	CO2

(i) $f_1(x,y) = \begin{bmatrix} 5 & 1 & 2 & 5 \\ 3 & 3 & 4 & 2 \\ 5 & 2 & 2 & 5 \\ 7 & 7 & 1 & 2 \end{bmatrix}$.

(ii)

$$f_2(x,y) = \begin{bmatrix} 1 & 3 & 5 \\ 4 & 4 & 3 \\ 5 & 2 & 2 \end{bmatrix}$$