SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM Nagar, Kattankulathur - 603 203

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

QUESTION BANK

VI SEMESTER

1908604 - DIGITAL IMAGE PROCESSING

Regulation - 2019

Academic Year 2024-2025(Even Semester)

Prepared by

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DEPARTMENT OF INFORAMTION TECHNOLOGY

QUESTION BANK

SUBJECT 1908604 DIGITAL IMAGE PROCESSING

SEM/YEAR: VI / III

UNIT I

DIGITAL IMAGE FUNDAMENTALS 9

Introduction - Origin - Steps in Digital Image Processing - Components - Elements of Visual Perception - Image Sensing and Acquisition - Image Sampling and Quantization - Relationships between pixels - color models, Two- dimensional mathematical preliminaries, 2D transforms - DFT.

PART-A

Q.No.	Questions	BT Level	Competence
1	Define spatial resolution. How it is represented quantitatively?	BTL 1	Remembering
2	What is a digital image? Define pixel	BTL 1	Remembering
3	Illustrate Sampling and Quantization. What is fine sampling and course sampling used?	BTL2	Understanding
4	Summarize in neighbor of a pixels of digital image processing system.	BTL2	Understanding
5	what is the function of an image sensor?	BTL2	Understanding
6	Construct the photonic electromagnetic spectrum..	BTL2	Understanding
7	Demonstrate Hue and saturation.	BTL2	Understanding
8	Distinguish between digital image, and binary image. Give suitable example to each type of images.	BTL 1	Remembering
9	List the applications of digital image processing	BTL2	Understanding
10	What do you mean by Color model? What are the primary and secondary colors.	BTL 1	Remembering
11	Summarize applications of color models	BTL2	Understanding
12	Differentiate photopic and scotopic vision.	BTL2	Understanding
13	Develop the steps involved in Digital Image Processing?	BTL2	Understanding
14	What are the connectivity / adjacency available in pixel relationships	BTL2	Understanding
15	Identify the difference between regions and boundaries.	BTL2	Understanding
16	Necessitate the need for transform	BTL 1	Remembering
17	How negative an image is obtained?	BTL 1	Remembering
18	Define histogram equalization?	BTL 1	Remembering
19	Demonstrate the properties of distance measures.	BTL2	Understanding
20	Discuss the different types of distance measures.	BTL2	Understanding
21	Define systems in Image Processing	BTL 1	Remembering
22	Define the term Luminance	BTL 1	Remembering
23	Compare Brightness and Contrast	BTL 1	Remembering
24	Demonstrate the image formation of the eye	BTL2	Understanding

PART-B

Q.No.	Questions	Marks	BT Level	Competence
1	Identify the basic element of digital image processing system and explain with neat block diagram.	13	BTL3	Applying
2	With neat sketches and necessary expressions, briefly explain how digital image is obtained by sampling and Quantization.	13	BTL4	Analyzing
3	What is Image Quantization? Evaluate and explain the various types of quantization with its properties and remarks.	13	BTL4	Analyzing

4	Details the steps in image processing? Explain	13	BTL3	Applying
5	Explain color image fundamentals and various models	13	BTL3	Applying
6	a) Explain structure of the human eye and vision	6	BTL3	Applying
	b) Construct a simple image formation model	7	BTL3	Applying
7	Explain the RGB model and how it is used	13	BTL3	Applying

8	Demonstrate the HSI color image model and how it is applied	13	BTL3	Applying
9	What is digital Imaging system? Explain various types of imaging system.	13	BTL3	Applying
10	Define Digital image and analyze the applications of Digital image Processing	13	BTL 4	Analyzing
11	Analyze basic relationship between pixels	13	BTL 4	Analyzing
12	List and explain the mathematical tools used in digital image processing? Explain each how it is applied.	13	BTL 4	Analyzing
13	Explain various types of images based on color.	13	BTL 5	Evaluating
14	Define transform and develop Discrete Fourier Transform	13	BTL 6	Creating
15	Write short notes on Image formation from the eye 8 – neighbor pixels Mixed pixels	 4 4 5	BTL 4	Analyzing
16	Explain in brief about the distance measures and how it is used	13	BTL3	Applying
17	Discuss the basic preliminaries of the 2D mathematical in image processing	13	BTL4	Analyzing

PART-C

Q.No.	Questions	Marks	BT Level	Competence
1	a) Write the short notes on color models	7	BTL5	Evaluating
	b) Explain in detail about Elements of Visual Perception	8	BTL5	Evaluating
2	Examine in detail about the RGB and HSI color image models along with its applications.	15	BTL5	Evaluating
3	Discuss on a) Image Acquisition b) Image Sampling c) Quantization	 5 5 5	BTL6	Creating
4	Develop a DFT algorithm for 2-D transform? How many additions and multiplication are needed to compute 2-D DFT of an NX N image?	15	BTL6	Creating
5	Explain the various types medical image in brief.	15	BTL5	Evaluating

UNIT II

UNIT-II: IMAGE ENHANCEMENT 9

Spatial Domain: Gray level transformations - Histogram processing - Basics of Spatial Filtering- Smoothing and Sharpening Spatial Filtering - Frequency Domain: Introduction to Fourier Transform- Smoothing and Sharpening frequency domain filters - Ideal, Butterworth and Gaussian filters

PART-A

Q.No.	Questions	BT Level	Competence
1	Define histogram.	BTL 1	Remembering
2	What is meant by histogram equalization?	BTL 1	Remembering
3	Specify the objective of image enhancement technique.	BTL2	Understanding

4	List the 2 categories of image enhancement.	BTL 1	Remembering
5	What is meant by Image Restoration?	BTL 1	Remembering
6	Give the difference between Enhancement and Restoration	BTL2	Understanding
7	Explain Laplacian filter?	BTL2	Understanding
8	Compare gradient and Laplacian operator	BTL2	Understanding
9	What is meant by masking?	BTL 1	Remembering
10	State sampling theorem	BTL2	Understanding
11	Define Fourier transform	BTL 1	Remembering
12	Demonstrate Fourier spectrum and spectral density	BTL2	Understanding
13	Differentiate Smoothing and Sharpening Spatial Filtering	BTL2	Understanding
14	Short note on Gaussian Filter	BTL2	Understanding
15	Discuss steps involved in frequency domain filtering	BTL2	Understanding
16	Identify the application of sharpening filters	BTL2	Understanding
17	Summarize the different types of derivative filters	BTL2	Understanding
18	Estimate the mask used for high boost filtering.	BTL2	Understanding
19	Define homomorphic filtering	BTL 1	Remembering
20	Explain the additivity property of Linear Operator	BTL2	Understanding
21	Define the linear transformation.	BTL 1	Remembering
22	Differentiate the Log and Inverse log	BTL2	Understanding
23	Discuss the power law	BTL2	Understanding
24	Differentiate n^{th} root and n^{th} power	BTL2	Understanding

PART-B

Q.No.	Questions	Marks	BT Level	Competence
1	Explain the histogram equalization method of image enhancement	13	BTL3	Applying
2	Explain the mechanics of spatial Filtering	13	BTL5	Evaluating
3	Explain frequency domain filtering techniques	13	BTL5	Evaluating
4	Construct Butterworth filters for image smoothening and image sharpening	13	BTL3	Applying
5	a)Summarize the relation for 1-D discrete Fourier transform and list the properties of one-dimensional DFT, 2D Fourier transform	6	BTL3	Applying
	b) Identify the point operations used in image enhancement? State any three with the transformation.	7	BTL3	Applying
6	Explain the smoothing spatial Filters and sharpening spatial Filter	13	BTL5	Evaluating
7	Briefly explain about the various types of image smoothening filters	13	BTL3	Applying
8	Write a details notes on and their applications i) Butterworth high pass filter ii) Gaussian high pass filter	 6 7	BTL3	Applying
9	Explain the following i) Butterworth low pass filter ii) Gaussian low pass filter	 6 7	BTL5	Evaluating
10	Write a details notes on and their applications i) Log transformations ii) Power -Law (Gamma) Transformations	 6 7	BTL3	Applying
11	Examine the following i) Unsharp Masking ii) High boost Filtering	6 7	BTL4	Analyzing
12	Design and Explain in detail about Ideal low pass and High pass filter	13	BTL6	Creating
13	Explain in detail about homomorphic filtering	13	BTL3	Applying

14	Describe the improvement of gray level transformation for an image	13	BTL3	Applying
15	Develop Butterworth filters to strengthen the sharpness and smoothness of images.	13	BTL6	Creating
16	Write detail note about i) Spatial domain enhancement ii) Frequency domain enhancement	6 7	BTL4	Analyzing
17	Explain the enhancement gray level transformation used for image	13	BTL3	Applying

PART-C

Q.No.	Questions	Marks	BT Level	Competence
1	If a low pass filter is formed that average the 4 - neighbors of a point (x,y) but excludes point(x,y) itself. Find the equivalent filter function H(u,v) in the frequency domain. Show that it is a low pass filter.	15	BTL6	Creating
2	Criticize in detail about image enhancement in the frequency domain.	15	BTL5	Evaluating
3	Explain in detail about the enhancement technique in spatial domain used for images	15	BTL5	Evaluating
4	Discuss on (i) Averaging filter (ii) Weighted Averaging filter	7 8	BTL6	Creating
5	Write down the limitations of Averaging filters.	15	BTL5	Evaluating

UNIT III

UNIT-III: IMAGE RESTORATION AND SEGMENTATION 9

Noise models - Mean Filters - Order Statistics - Adaptive filters - Band reject Filters - Band pass Filters - Notch Filters - Optimum Notch Filtering - Inverse Filtering - Wiener filtering Segmentation: Detection of Discontinuities- Edge Linking and Boundary detection - Region based segmentation Morphological processing- erosion and dilation.

PART-A

Q.No.	Questions	BT Level	Competence
1	Define Gaussian noise	BTL 1	Remembering
2	Describe the various noise model	BTL2	Understanding
3	List out various types of mean filter	BTL 1	Remembering
4	Short note on geometric mean filter	BTL2	Understanding
5	Differentiate restoration and enhancement	BTL2	Understanding
6	Build the model for image restoration	BTL 1	Remembering
7	Mention the most appropriate filter that is used for removing impulse noise from an image.	BTL2	Understanding
8	Which filter used to remove periodic noise? Why?	BTL2	Understanding
9	Mention the most suitable filter that is used to extract the Noise patterns	BTL2	Understanding
10	Identify the list of operations involved in morphology.	BTL2	Understanding
11	Define structure element	BTL 1	Remembering
12	Differentiate between dilation and erosion.	BTL2	Understanding
13	Describe the Hit-or-Miss transformation	BTL2	Understanding
14	How boundary extraction evaluated by morphological processing.	BTL2	Understanding
15	Write the importance of inverse filtering in digital image processing	BTL2	Understanding
16	Write the transfer function for Notch filters	BTL 1	Remembering
17	Mention other name of Wiener filter	BTL 1	Remembering
18	What are the fundamental steps performed in Edge detection	BTL 1	Remembering

19	Describe about region based segmentation	BTL2	Understanding
20	Explain boundary segmentation	BTL2	Understanding
21	Define Image Enhancement	BTL 1	Remembering
22	State the definition of erosion	BTL2	Understanding
23	Discuss the noise and their types	BTL 1	Remembering
24	What you meant by impulse noise	BTL 1	Remembering

PART-B				
Q.No.	**Questions**	**Marks**	**BT Level**	**Competence**
1	Derive wiener filter for image restoration using the minimum mean square approach	13	BTL5	Evaluating
2	Identify the application of image segmentations? Explain each.	13	BTL3	Applying
3	Short notes on i) Band reject Filters ii) Band pass Filters	6 7	BTL3	Applying
4	What is image restoration? Explain the degradation model for continuous function in detail.	13	BTL4	Analyzing
5	Explain image degradation model /restoration process in detail.	13	BTL3	Applying
6	Develop a wiener filter for mage restoration and specify its advantages over inverse filter	13	BTL3	Applying
7	Explain region splitting and merging technique for image segmentation with suitable examples.	13	BTL5	Evaluating
8	Explain Morphological processing- erosion and dilation	13	BTL5	Evaluating
9	Discuss about opening and closing for gray scale images.	13	BTL6	Creating
10	What are the gradient operation? What are the various operators used for image segmentation based on edge detection? Explain	13	BTL3	Applying
11	What is meant by discontinuities in an image? Discuss about point detection, line detection?	13	BTL3	Applying
12	How is edge detection done using Sobel operator? What are the advantages of Sobel operator over Prewitt operator?	13	BTL4	Analyzing
13	a) Discuss the concept of boundary segments.	6	BTL6	Creating
	b) Write about linking edge points.	7	BTL3	Applying
14	Explain briefly a) Region based segmentation b) order statistics filter	6+7	BTL3	Applying
15	Discover the use for picture segmentation approach in depth explanation.	13	BTL3	Applying
16	Write a comprehensive of the image restoration and degradation processes.	13	BTL6	Creating
17	Role-play of band pass filters and band reject filter in digital image processing	13	BTL6	Creating

PART-C				
Q.No.	**Questions**	**Marks**	**IBT Level**	**Competence**
1	I Explain about image segmentation in detail.	15	I BTL6	Creating

2	Illustrate basic details of boundary in an images. Explain how boundary is used in representing images	15	BTL5	Evaluating
3	Explain Morphological processing- Explain and illustrate Hit or miss transform morphological algorithm with an example	15	BTL5	Evaluating
4	Discuss on i) Notch Filters ii) Optimum Notch Filters iii) Mean Filters	5 5 5	BTL6	Creating
5	Write a details about the Region. Explain how region is used in digital Image processing	15	BTL6	Creating

UNIT IV

UNIT-IV: WAVELETS AND IMAGE COMPRESSION 9

Wavelets - Sub band coding - Multi resolution expansions - Compression: Fundamentals - Image Compression models - Error Free Compression - Variable Length Coding - Bit Plane Coding - Lossless Predictive Coding - Lossy Compression - Lossy Predictive Coding - Compression Standards

PART-A

Q.No.	Questions	BT level	Competence
1	State the advantages of Wavelets.	BTL 1	Remembering
2	Explain Haar wavelet transform	BTL2	Understanding
3	Compare scaling and wavelet functions	BTL2	Understanding
4	How wavelet transform differ from Fourier transform.	BTL2	Understanding
5	What do you meant by multi resolution?	BTL 1	Remembering
6	What is image compression?	BTL 1	Remembering
7	What is Data Compression?	BTL 1	Remembering
8	Why Compression is important?	BTL2	Understanding
9	Define sub band coding.	BTL2	Understanding
10	Identify types of Data compression?	BTL2	Understanding
11	Define compression ratio.	BTL2	Understanding
12	Develop the operations performed by error free compression.	BTL2	Understanding
13	Construct a general compression system model	BTL2	Understanding
14	List the different coding techniques used in DIP?	BTL2	Understanding
15	Define is coding redundancy?	BTL2	Understanding
16	Define interpixel redundancy?	BTL2	Understanding
17	What is Variable Length Coding?	BTL 1	Remembering
18	What is run length coding?	BTL 1	Remembering
19	Evaluate Huffman coding.	BTL2	Understanding
20	Develop the basic steps in JPEG.	BTL2	Understanding
21	Define Scaling	BTL 1	Remembering
22	Write the importance of Image Compression	BTL2	Understanding
23	Explain the wavelet function in image processing	BTL 1	Remembering
24	Discover the basic principles of muti resolutions	BTL2	Understanding

PART-B

Q.No.	Questions	Marks	BT level	Competence
1	Discuss about wavelet and explain any one wavelet transforms	13	BTL6	Creating
2	Define Compression and Explain the general compression system model	13	BTL4	Analyzing
3	Explain about Error free Compression?	13	BTL3	Applying
4	Explain about Lossy compression?	13	BTL3	Applying
5	Explain Huffman coding with an example.	13	BTL5	Evaluating
6	Describe the concepts of run length coding with example	13	BTL4	Analyzing
7	Design Huffman coding for the following symbols Symbols P Q R s Probability 0.4 0.2 0.3 0.1	13	BTL6	Creating
8	Explain Lossy Predictive coding Model?	13	BTL5	Evaluating
9	Explain arithmetic coding method for image compression in detail.	13	BTL4	Analyzing
10	Explain about Image compression standards?	13	BTL3	Applying
11	Explain the JPEG standard for still images with block schematic	13	BTL3	Applying

12	Describe various steps involved in encoding an image using JPEG standard.	13	BTL3	Applying
13	Short notes on i) sub band coding ii) Bit plane coding	6 7	BTL3	Applying
14	How to apply compression over moving frames and construct the suitable compression standard	13	BTL3	Applying
15	Discuss about MPEG standard and compare with JPEG	13	BTL6	Creating
16	Design and explain the block diagram of MPEG encoder	13	BTL6	Creating
17	Write notes on i)Vector quantization ii)JPEG standard	6 7	BTL6	Creating

	PART-C			
Q.No.	**Questions**	**Marks**	**BT Level**	**Competence**
1	Define Compression and explain data Redundancy in image compression	15	BTL5	Evaluating
2	Discuss on i) Lossless Predictive coding ii) Lossy Predictive coding	7 8	BTL6	Creating
3	With neat block diagram, explain transform based image compression scheme. Also give two reason for the choice of Discrete Cosine Transform in JPEG image compression standard.	15	BTL5	Evaluating
4	Explain how entropy encoding of JPEG encoder is used to encode the DCT of image block.	15	BTL5	Evaluating
5	Discuss the need for image compression. Perform Huffman algorithm for the following intensity distribution, for a 64x64 image. Obtain the coding efficiency and compare with that of uniform length code. r0=1008, r1=320, r2=456, r3=686, r4=803, r5=105, r6=417, r7=301	15	BTL6	Creating

UNIT V
IMAGE REPRESENTATION AND RECOGNITION

Boundary representation - Chain Code - Polygonal approximation, signature, boundary segments - Boundary description - Shape number - Fourier Descriptor, moments Regional Descriptors - Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching.

PART-A

Q.No.	**Questions**	**BT Level**	**Competence**
1	What do you meant by high level image processing?	BTL 1	Remembering
2	List the classification of representation technique	BTL2	Understanding
3	Define boundary.	BTL2	Understanding
4	Define Chain codes?	BTL2	Understanding
5	Discuss the various polygonal approximation methods.	BTL2	Understanding
6	How signature represents in image processing	BTL2	Understanding
7	Discuss various image representation approaches	BTL2	Understanding
8	List the detection methods for boundary detection	BTL2	Understanding
9	Define patterns	BTL2	Understanding
10	What are the components of pattern recognition System	BTL 1	Remembering
11	What are the various approaches for pattern recognition?	BTL 1	Remembering
12	Develop training pattern and training set	BTL2	Understanding
13	Describe the splitting techniques	BTL2	Understanding
14	Describe the Merging techniques	BTL2	Understanding
15	Name few boundary descriptors	BTL2	Understanding
16	Estimate the parameters used for boundary descriptor	BTL2	Understanding
17	State the representation of classifier	BTL 1	Remembering
18	Name few measures used as simple descriptor in region descriptor	BTL2	Understanding
19	What is thinning and skeletonizing algorithm?	BTL 1	Remembering
20	Define eccentricity	BTL 1	Remembering
21	Define Reflection	BTL 1	Remembering

22	Describe the Scattering	BTL 1	Remembering
23	Write the full form of CCD and CMOS	BTL2	Understanding
24	What are properties in digital image sensors	BTL 1	Remembering

PART-B				
Q.No.	**Questions**	**Marks**	**BT Level**	**Competence**
1	Define and explain the various boundary representation approaches?	13	BTL3	Applying
2	Define boundary. Explain how boundary is used in representing images. Discuss the concept of boundary segments	13	BTL6	Creating
3	Explain the polygon approximation approach using minimum perimeter polygon method	13	BTL3	Applying
4	Explain the various boundary descriptors in details with neat diagram	13	BTL3	Applying
5	Explain in detail the various Fourier descriptors with a necessary equations.	13	BTL4	Analyzing
6	Explain regional descriptors in detail with a neat diagram.	13	BTL4	Analyzing
7	Explain the two techniques of region representation	13	BTL4	Analyzing
8	Explain the segmentation techniques that are based on finding the Regions directly.	13	BTL3	Applying
9	Explain moment regional descriptors **in** detail with a neat diagram.	13	BTL3	Applying
	Short notes on i) Signatures ii) Boundary Segments.	6 7	BTL4	Analyzing
11	List the approaches to describe texture of a region and explain each	13	BTL3	Applying
12	List measures used as simple descriptors in region descriptors and explain each	13	BTL4	Analyzing
13	Briefly explain Topological descriptors.	13	BTL6	Creating
14	How to apply Shape Numbers technique used to represents the image.	13	BTL3	Applying
15	Develop a simple explanation of Photometric Image Formation	13	BTL6	Creating
16	Sketch the flowchart and explain the details of Image sensing Pipeline from the digital camera	13	BTL3	Applying
17	Relate the local and global operations is used to image representation in details	13	BTL3	Applying

PART-C				
Q.No.	**Questions**	**Marks**	**BT Level**	**Competence**
1	Explain the boundary representation of object and chain codes.	15	BTL5	Evaluating
2	Specify the various polygonal approximation methods and Explain about Polygon approximations	15	BTL5	Evaluating
3	Explain in detail about Patterns and Pattern Classes	15	BTL6	Creating
4	Explain in detail about the object recognition techniques based on matching	15	BTL5	Evaluating
5	Categorize the computer vision image formation and representation	15	BTL4	Analyzing