

SRM VALLIAMMAI ENGINEERING COLLEGE
(An Autonomous Institution)

SRM Nagar, Kattankulathur – 603 203

DEPARTMENT OF INFORMATION TECHNOLOGY

QUESTION BANK



VI SEMESTER

1908604 – DIGITAL IMAGE PROCESSING

Regulation – 2019

Academic Year 2021 – 2022(Even Semester)

Prepared by

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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	What is a digital image? Define pixel.	BTL 1	Remembering
2	Define Resolutions.	BTL 1	Remembering
3	Illustrate Sampling and Quantization.	BTL 2	Understanding
4	Summarize in detail the elements of digital image processing system.	BTL 2	Understanding
5	Conclude Image sensing and Acquisition.	BTL 4	Analyzing
6	Identify the properties of uniform restoration.	BTL 3	Applying
7	Demonstrate Hue and saturation.	BTL 2	Understanding
8	Distinguish between digital image, and binary image. Give suitable example to each type of images.	BTL 4	Analyzing
9	Evaluate the applications of digital image processing	BTL 5	Evaluating
10	What do you meant by Color model?	BTL 1	Remembering
11	Summarize applications of color models	BTL 2	Understanding
12	Examine the Dynamic Range?	BTL 4	Analyzing
13	Develop the steps involved in Digital Image Processing?	BTL 3	Applying
14	Formulate illumination and reflectance.	BTL 6	Creating
15	Apply the translation and scaling over image.	BTL 3	Applying
16	What is the need for transform?	BTL 1	Remembering
17	List the applications of transform	BTL 1	Remembering
18	Define histogram equalization?	BTL 1	Remembering
19	Classify various types of images.	BTL 2	Understanding
20	Distinguish JPEG, TIFF, GIFF image file formats	BTL 4	Analyzing

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	BTL 3	Applying
2	With neat sketches and necessary expressions, briefly explain about image sampling in detail	13	BTL 2	Understanding
3	What is Image Quantization? Evaluate and explain the various types of quantization with its properties and remarks.	13	BTL 4	Analyzing
4	Recall the fundamental steps in image processing? Explain.	13	BTL 1	Remembering
5	Explain color image fundamentals.	13	BTL 2	Understanding
6	a) Explain structure of the human eye.	6	BTL 2	Understanding
	b) Construct a simple image formation model	7	BTL 3	Applying
7	Explain the RGB model	13	BTL 1	Remembering

8	Demonstrate the HSI color image model	13	BTL 2	Understanding
9	What is digital Imaging system? Explain various types of imaging system.	13	BTL 1	Remembering
10	Explain Digital image and application of Digital image Processing	13	BTL 1	Remembering
11	Analyze basic relationship between pixels	13	BTL 4	Analyzing
12	What are the mathematical tools used in digital image processing? Explain each.	13	BTL 1	Remembering
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

PART – C				
Q.No.	Questions	Marks	BT Level	Competence
1	a)Write the short notes on color models	7	BTL 5	Evaluating
	b)Explain in detail about Elements of Visual Perception	8	BTL 5	Evaluating
2	Examine in detail about the RGB and HSI color image models.	15	BTL 4	Analyzing
3	Discuss on a) Image Acquisition b) Image Sampling c) Quantization	5 5 5	BTL 6	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	BTL 6	Creating

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.	BTL 2	Understanding
4	List the 2 categories of image enhancement.	BTL 4	Analyzing
5	What is meant by Image Restoration?	BTL 1	Remembering
6	Give the difference between Enhancement and Restoration	BTL 4	Analyzing
7	Explain laplacian filter?	BTL 5	Evaluating
8	Compare gradient and laplacian operator	BTL 4	Analyzing
9	What is meant by masking?	BTL 1	Remembering
10	State sampling theorem	BTL 2	Understanding
11	Define Fourier transform	BTL 1	Remembering
12	Demonstrate Fourier spectrum and spectral density	BTL 3	Applying
13	Differentiate Smoothing and Sharpening Spatial Filtering	BTL 4	Analyzing
14	Short note on Gaussian Filter	BTL 2	Understanding
15	Discuss steps involved in frequency domain filtering	BTL 6	Creating
16	Identify the application of sharpening filters	BTL 3	Applying
17	Summarize the different types of derivative filters	BTL 2	Understanding
18	Estimate the mask used for high boost filtering.	BTL 5	Evaluating
19	Define homomorphic filtering	BTL 1	Remembering

20	Criticize the additivity property of Linear Operator	BTL 2	Understanding
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PART – B				
Q.No.	Questions	Marks	BT Level	Competence
1	With neat diagram explain Histogram processing and equalization	13	BTL 2	Understanding
2	Classify the gray level transformation used for image enhancement	13	BTL 4	Analyzing
3	Explain the mechanics of spatial Filtering	13	BTL 5	Evaluating
4	Explain frequency domain filtering fundamentals	13	BTL 1	Remembering
5	Construct Butterworth filters for image smoothening and image sharpening	13	BTL 3	Applying
6	a) Summarize the relation for 1-D discrete Fourier transform and list the properties of one-dimensional DFT, 2D Fourier transform	6	BTL 2	Understanding
	b) Identify the point operations used in image enhancement? State any three with the transformation.	7	BTL 3	Applying
7	Explain the smoothing spatial Filters and sharpening spatial Filter	13	BTL 5	Evaluating
8	Briefly explain about the various types of image smoothening filters	13	BTL 2	Understanding
9	Short note on i) Butterworth high pass filter ii) Gaussian high pass filter	6 7	BTL 1	Remembering
10	Explain the following i) Butterworth low pass filter ii) Gaussian low pass filter	6 7	BTL 5	Evaluating
11	Short notes on i) Log transformations ii) Power –Law (Gamma) Transformations	6 7	BTL 1	Remembering
12	Examine the following i) Unsharp Masking ii) High boost Filtering	6 7	BTL 4	Analyzing
13	Design and Explain in detail about Ideal low pass and High pass filter	13	BTL 6	Creating
14	Explain in detail about homomorphic filtering	13	BTL 1	Remembering

PART – C				
Q.No.	Questions	Marks	BT Level	Competence
1	If a low pass filter is formed that average the 4 – neighbours 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	BTL 6	Creating
2	Criticize in detail about image enhancement in the frequency domain.	15	BTL 5	Evaluating
3	Explain in detail about the enhancement technique in spatial domain used for images	15	BTL 5	Evaluating
4	a) Discuss on (i) Averaging filter (ii) Weighted Averaging filter	5 5	BTL 6	Creating
	b) Write down the limitations of Averaging filters.	5	BTL 2	Understanding

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	BTL 2	Understanding
3	List out various types of mean filter	BTL 4	Analyze
4	Short note on geometric mean filter	BTL 2	Understanding
5	Differentiate restoration and enhancement	BTL 4	Analyzing
6	Build the model for image restoration	BTL 3	Applying
7	Mention the most appropriate filter that is used for removing impulse noise from an image.	BTL 6	Creating
8	Which filter used to remove periodic noise? Why?	BTL 5	Evaluating
9	Mention the most suitable filter that is used to extract the Noise patterns	BTL 6	Creating
10	Identify the list of operations involved in morphology.	BTL 3	Applying
11	Define structure element	BTL 1	Remembering
12	Differentiate between dilation and erosion.	BTL 4	Analyzing
13	Describe the Hit-or-Miss transformation	BTL 2	Understanding
14	How boundary extraction evaluated by morphological processing.	BTL 5	Evaluating
15	Tell the importance of inverse filtering in digital image processing	BTL 3	Applying
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	BTL 2	Understanding
20	Explain boundary segmentation	BTL 2	Understanding

PART – B

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

PART – C

Q.No.	Questions	Marks	BT Level	Competence
1	Explain about image segmentation in detail.	15	BTL 6	Creating

2	Define boundary. Explain how boundary is used in representing images	15	BTL 6	Creating
3	Explain Morphological processing- Explain and illustrate Hit or miss transform morphological algorithm with an example	15	BTL 5	Evaluating
4	Discuss on i) Notch Filters ii) Optimum Notch Filters iii) Mean Filters	5 5 5	BTL 6	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	Define wavelets.	BTL 1	Remembering
2	Explain Haar wavelet transform	BTL 2	Understanding
3	Compare scaling and wavelet functions	BTL 5	Evaluating
4	How wavelet transform differ from Fourier transform.	BTL 4	Analyzing
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?	BTL 4	Analyzing
9	Define sub band coding.	BTL 2	Understanding
10	Identify types of Data compression?	BTL 3	Applying
11	Define compression ratio.	BTL 2	Understanding
12	Develop the operations performed by error free compression.	BTL 6	Creating
13	Construct a general compression system model	BTL 6	Creating
14	List the different coding techniques used in DIP?	BTL 4	Analyzing
15	Define is coding redundancy?	BTL 2	Understanding
16	Define interpixel redundancy?	BTL 2	Understanding
17	What is Variable Length Coding?	BTL 1	Remembering
18	What is run length coding?	BTL 1	Remembering
19	Evaluate Huffman coding.	BTL 2	Understanding
20	Develop the basic steps in JPEG.	BTL 3	Applying

PART – B

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

12	Describe various steps involved in encoding an image using JPEG standard.	13	BTL 3	Applying
13	Short notes on i) sub band coding ii) Bit plane coding	6 7	BTL 1	Remembering
14	How to apply compression over moving frames and construct the suitable compression standard	13	BTL 3	Applying

PART – C				
Q.No.	Questions	Marks	BT Level	Competence
1	Define Compression and explain data Redundancy in image compression	15	BTL 5	Evaluating
2	Discuss on i) Lossless Predictive coding ii) Lossy Predictive coding	7 8	BTL 6	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	BTL 5	Evaluating
4	Explain how entropy encoding of JPEG encoder is used to encode the DCT of image block.	15	BTL 4	Analyzing

UNIT V				
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		BTL 4	Analyzing
3	Define boundary.		BTL 2	Understanding
4	Define Chain codes?		BTL 2	Understanding
5	Discuss the various polygonal approximation methods.		BTL 6	Creating
6	How signature represents in image processing		BTL 3	Applying
7	Discuss various image representation approaches		BTL 6	Creating
8	List the detection methods for boundary detection		BTL 4	Analyzing
9	Define patterns		BTL 2	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		BTL 3	Applying
13	Describe the splitting techniques		BTL 2	Understanding
14	Describe the Merging techniques		BTL 2	Understanding
15	Name few boundary descriptors		BTL 4	Analyzing
16	Estimate the parameters used for boundary descriptor		BTL 5	Evaluating
17	State the representation of classifier		BTL 1	Remembering
18	Name few measures used as simple descriptor in region descriptor		BTL 4	Analyzing
19	What is thinning and skeletonizing algorithm?		BTL 1	Remembering
20	Define eccentricity		BTL 1	Remembering

PART – B				
Q.No.	Questions	Marks	BT Level	Competence
1	Define and explain the various boundary representation approaches?	13	BTL 1	Remembering
2	Define boundary. Explain how boundary is used in representing images. Discuss the concept of boundary segments	13	BTL 6	Creating
3	Explain the polygon approximation approach using	13	BTL 1	Remembering

	minimum perimeter polygon method			
4	Explain the various boundary descriptors in details with neat diagram	13	BTL 1	Remembering
5	Explain in detail the various fourier descriptors with a necessary equations.	13	BTL 4	Analyzing
6	Explain regional descriptors in detail with a neat diagram.	13	BTL 2	Understanding
7	Explain the two techniques of region representation	13	BTL 2	Understanding
8	Explain the segmentation techniques that are based on finding the Regions directly.	13	BTL 3	Applying
9	Explain moment regional descriptors in detail with a neat diagram.	13	BTL 2	Understanding
10	Short notes on i) Signatures ii) Boundary Segments.	6 7	BTL 4	Analyzing
11	List the approaches to describe texture of a region and explain each	13	BTL 2	Understanding
12	List measures used as simple descriptors in region descriptors and explain each	13	BTL 4	Analyzing
13	Briefly explain Topological descriptors.	13	BTL 6	Creating
14	How to apply Shape Numbers technique used to represents the image.	13	BTL 3	Applying

PART – C				
Q.No.	Questions	Marks	BT Level	Competence
1	Explain the boundary representation of object and chain codes.	15	BTL 5	Evaluating
2	Specify the various polygonal approximation methods and Explain about Polygon approximations	15	BTL 5	Evaluating
3	Explain in detail about Patterns and Pattern Classes	15	BTL 6	Creating
4	Explain in detail about the object recognition techniques based on matching	15	BTL 3	Analyzing