INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

ELECTRONICS AND COMMUNICATION ENGINEERING

TUTORIAL QUESTION BANK

Course Title	**DIGITAL IMAGE PROCESSING**				
Course Code	**AEC508**				
Programme	B.Tech				
Semester	VII	ECE			
Course Type	Elective				
Regulation	IARE - R16				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	1	4	3	2
Chief Coordinator	Dr. S China Venkateswarlu, Professor				
Course Faculty	Mr. D Khalandar Basha, Assistant Professor. Ms. M.Saritha, Assistant Professor Mr. B.Santhosh Kumar, Assistant Professor				

COURSE OBJECTIVES:

The course should enable the students to:	
I	Understand the image fundamentals and mathematical transforms necessary for image processing
II	Describe the image enhancement techniques.
III	Evaluate the image restoration procedures
IV	Analyze the image compression procedures
V	Design the image segmentation and representation techniques.

COURSE OUTCOMES (COs):

CO 1	Review the fundamental concepts of a Digital Image Processing System. Analyze general terminology of DIP. Examine various types of Transforms
CO 2	Examine various types of images, intensity transforms and Image Enhancement with spatial filtering. Develop FT for Image Enhancement in frequency domain. Analyze images in the frequency domain using various filters.
CO 3	Evaluate the model, approaches, and filtering techniques for image Restoration.

CO 4	Interpret Image Segmentation and representation techniques. Evaluate the methodologies for image segmentation, restoration etc.
CO 5	Categorize various Compression techniques and Interpret Image Compression standards.

COURSE LEARNING OUTCOMES:

AEC508.01	Understand the image fundamentals, image transforms, relationship between pixels.
AEC508.02	Explore sampling and quantization in terms of images.
AEC508.03	Analyze the types of transforms, properties mathematical proofs etc.,
AEC508.04	Determine the Advanced transforms, implementations using software's
AEC508.05	Explore the Image enhancement in spatial domain, different types of point processing.
AEC508.06	Understand the Histogram , histogram manipulation, Linear and nonlinear gray level transformation
AEC508.07	Analyze the Local or neighborhood operation, median filter processing, Spatial domain high pass filtering etc.
AEC508.08	Generating filters directly in the frequency domain, obtaining frequency domain filters from spatial filters
AEC508.09	Understand the filtering in frequency domain, smoothing and sharpening filters in frequency domain.
AEC508.10	Understand the Image restoration degraded model
AEC508.11	Determine algebraic approach to restore and inverse filtering.
AEC508.12	Understand Least mean square filters
AEC508.13	Determine the constrained least square restoration, restoration, image restoration
AEC508.14	Illustrate the Image segmentation detection of discontinuities and edge linking and boundary detection.
AEC508.15	Determine the threshold and the region oriented segmentation morphological image processing dilation and erosion.
AEC508.16	Understand structuring element decomposition, the strel function, opening and closing and hit and miss transform.
AEC508.17	Describe the image compression, redundancies and removal methods.
AEC508.18	Understand fidelity criteria, image compression models, source encoder and decoder, error free compression
AEC508.19	Determine lossy compression, JPEG 2000 standards

TUTORIAL QUESTION BANK

S. No	QUESTION	Blooms Taxonomy Level	Course Outcome	Course learning Outcome
UNIT-I INTRODUCTION				
PART-A (SHORT ANSWER QUESTIONS)				
1	Explain the steps involved in digital image processing?	Remember	CO 1	AEC508.01
2	Explain Sampling and Quantization	Remember	CO 1	AEC508.02
3	Discuss about the Slant transform(1-D &2-D)	Remember	CO 1	AEC508.03
4	What is meant by Digital Image Processing?	Remember	CO 1	AEC508.04
5	Explain the process of image acquisition.	Remember	CO 1	AEC508.01
6	Explain about image sampling and quantization process.	Remember	CO 1	AEC508.02
7	Define spatial and gray level resolution.	Remember	CO 1	AEC508.03
8	Explain about the basic relationships and distance measures between pixels in a digital image.	Remember	CO 1	AEC508.04
9	Define Fourier Transform and its inverse.	Understand	CO 1	AEC508.01
10	Define discrete Fourier transform and its inverse.	Remember	CO 1	AEC508.02
11	State distributive and scaling property.	Understand	CO 1	AEC508.03
12	Explain the basic principle of Hotelling transform.	Remember	CO 1	AEC508.04
13	Write about Slant transform.	Understand	CO 1	AEC508.01
14	What are the properties of Slant transform?	Remember	CO 1	AEC508.02
15	Write about Hadamard transform	Remember	CO 1	AEC508.03
16	Explain about discrete cosine transform	Understand	CO 1	AEC508.03
17	What are the properties of Hadamard transform?	Remember	CO 1	AEC508.03
18	What are the properties of Hotelling transform?	Remember	CO 1	AEC508.03
19	Explain relationship between pixels.	Understand	CO 1	AEC508.01
20	What is the need of transform for digital Image processing?	Remember	CO 1	AEC508.03
PART-B (LONG ANSWER QUESTIONS)				
1	Discuss about the following relationships between pixels with neat diagrams i) neighbors of pixels? ii)connectivity iii)distance measures iv)path	Understand	CO 1	AEC508.01
2	Briefly explain the forward and inverse transformation kernels' of image transforms	Remember	CO 1	AEC508.02
3	State and prove separability property of 2D-FFT	Understand	CO 1	AEC508.03
4	State and prove the translation property. Write the expressions for Walsh transforms kernel and Walsh transform(1D &2D)?	Understand	CO 1	AEC508.04
5	Write the Walsh transform forward and reverse kernels.	Understand	CO 1	AEC508.01
6	What is the need for transform? Specify the properties of 2D Fourier transform.	Remember	CO 1	AEC508.02
7	State distributivity and scaling property.	Understand	CO 1	AEC508.03
8	Explain how digital images can be represented? What is Image Transform?	Understand	CO 1	AEC508.04
9	What are the fundamental steps in Digital Image Processing?	Remember	CO 1	AEC508.01
10	What are the components of an Image Processing System?	Remember	CO 1	AEC508.02
11	Explain about elements of visual perception. Define Haar transform.	Remember	CO 1	AEC508.01
12	Write about perspective image transformation.	Remember	CO 1	AEC508.02
13	Briefly explain the forward and inverse transformation kernals of image transforms	Remember	CO 1	AEC508.03
14	Explain about walsh transform with algorithms.	Remember	CO 1	AEC508.03
15	Explain about Aliasing and Moiré Patterns.	Remember	CO 1	AEC508.03

S. No	QUESTION	Blooms Taxonomy Level	Course Outcome	Course learning Outcome
16	Explain the basic principle of Hotelling transform. Discuss about the hotelling transform(1-D &2-D)	Remember	CO 1	AEC508.04
17	Explain about Haar transform with algorithms, What are the properties of Haar transform. State and prove separability property of 2D-FFT	Remember	CO 1	AEC508.03
18	What are the properties of Walsh transform, Write about Walsh transform. State distributivity and scaling property	Remember	CO 1	AEC508.04
19	State distributivity and scaling property.	Understand	CO 1	AEC508.03
20	Explain about Perspective image transformation.	Remember	CO 1	AEC508.04
PART-C (PROBLEM SOLVING AND CRITICAL THINKING QUESTIONS)				
1	Determine $F=H.f.H^T$ =H.f.H with 2-D use 4x4 image by using Hadamard Transform	Apply	CO 1	AEC508.01
2	Discuss about the Hadamard tansform(1-D &2-D). Find the number of bits required to store a 256 X 256 image with 32 gray levels?	Understand	CO 1	AEC508.02
3	Find the DCT of the following sequence f(x)={1,2,4,7}	Apply	CO 1	AEC508.03
4	f(x)={1,2,0,3} with N=4, image size is (4x4) using find F=H.F , using Hadamard Transform	Understand	CO 1	AEC508.04
5	Name and explain some important properties of 2-D DFT.State and prove the translation property.	Apply	CO 1	AEC508.01
6	Find mean μ_x , c_x , Eigen Vector and Eigen values using KL_ Hotelling Transform , X: x={(1 2), (2 1), (2,2) , (3, 1)} with help of 4x4 image .	Apply	CO 1	AEC508.02
7	Generate one Haar Basis for N=2 , n=1,q=0 or1 , Determine the value k, Z , verify the conditions, $H_k(Z)$, z=0, ½ .	Apply	CO 1	AEC508.03
8	F(x)={1,2,0,3} Apply Walsh Transform , determine F=W.f, F=W.f W^T =W f W	Understand	CO 1	AEC508.04
9	Write the expressions for Walsh transforms kernel and Walsh transform (1D &2D)?	Apply	CO 1	AEC508.01
10	Calculate S_n,a_n and s_n with help of 8x8 Slant matrix for N=8, n=3, b_3= square root 5/ square root 21 and a_3=4/square root 21.	Understand	CO 1	AEC508.02
UNIT-II IMAGE ENHANCEMENT				
PART-A(SHORT ANSWER QUESTIONS)				
1	What are types of Image Enhancement and Explain two domains	Remember	CO 2	AEC508.05
2	Write about histogram specification.	Remember	CO 2	AEC508.06
3	Explain about image averaging process.	Remember	CO 2	AEC508.07
4	Distinguish between spatial domain and frequency domain enhancement techniques.	Remember	CO 2	AEC508.08
5	Explain about Ideal Low Pass Filter (ILPF) in frequency domain.	Understand	CO 2	AEC508.09
6	Explain smoothing spatial filters and nonlinear order static spatial filters.	Remember	CO 2	AEC508.05
7	Explain about Prewitt and sobel edge detectors.	Understand	CO 2	AEC508.06
8	Compare the characteristics of low pass, high pass and homomorphic filters in image enhancement in frequency domain.	Apply	CO 2	AEC508.07
9	Explain Median filter processing	Understand	CO 2	AEC508.08
10	Explain Spatial domain high pass filtering	Understand	CO 2	AEC508.09

S. No	QUESTION	Blooms Taxonomy Level	Course Outcome	Course learning Outcome
11	The frequency domain techniques of image enhancement in detail	Understand	CO 2	AEC508.09
12	Explain about Ideal High Pass Filter.	Remember	CO 2	AEC508.09
13	Explain about median filter processing	Understand	CO 2	AEC508.09
14	Explain filtering in frequency domain.	Remember	CO 2	AEC508.09
15	How generating filters directly in the frequency domain.	Understand	CO 2	AEC508.09
16	Explain image enhancement in spatial domain.	Understand	CO 2	AEC508.08
17	Describe enhancement through point processing	Understand	CO 2	AEC508.09
18	What are the types of point processing?	Remember	CO 2	AEC508.08
19	Explain about histogram manipulation.	Remember	CO 2	AEC508.08
20	Distinguish between linear and non-linear gray level transformation	Remember	CO 2	AEC508.08
	PART-B (LONG ANSWER QUESTIONS)			
1	What is meant by image enhancement by point processing? Discuss any two methods in it.	Understand	CO 2	AEC508.05
2	Define histogram of a digital image. Explain how histogram is useful in image enhancement?	Understand	CO 2	AEC508.06
3	Write about Local enhancement and Explain Smoothing Spatial filters.	Understand	CO 2	AEC508.07
4	Discuss about the mechanics of filtering in spatial domain. Mention the points to be considered in implementation neighborhood operations for spatial filtering.	Understand	CO 2	AEC508.08
5	What is meant by image subtraction? Discuss various areas of application of image subtraction.	Understand	CO 2	AEC508.09
6	Discuss the frequency domain techniques of image enhancement in detail.	Understand	CO 2	AEC508.05
7	Discuss about Butterworth low pass filter with a suitable example.	Understand	CO 2	AEC508.06
8	Discuss about Gaussian High Pass and Gaussian Low Pass Filter.	Understand	CO 2	AEC508.07
9	Explain high boost and high frequency filtering. What is meant by the Gradient and the Laplacian? Discuss their role in image enhancement.	Understand	CO 2	AEC508.08
10	Explain the concept of homomorphic filtering.	Understand	CO 2	AEC508.09
11	Write brief notes on histogram manipulation process.	Understand	CO 2	AEC508.08
12	what are the types of point processing techniques and explain any two techniques	Understand	CO 2	AEC508.07
13	How does generating filters directly in the frequency domain.	Understand	CO 2	AEC508.06
14	Write brief notes about neighborhood operation process.	Understand	CO 2	AEC508.09
15	What are the types of median filter processing methods explain each briefly.	Remember	CO 2	AEC508.08
16	What are the types of point processing explain each briefly.	Understand	CO 2	AEC508.09
17	Explain a type of Gaussian filters with neat diagrams. Discuss about Ideal High Pass Filter and Butterworth High Pass filter.	Understand	CO 2	AEC508.09
18	What is an Ideal filter explain types of ideal filters.	Understand	CO 2	AEC508.08
19	What is an enhancement in digital image processing and explain how does enhancement through point processing	Understand	CO 2	AEC508.09
20	Describe the image enhancement in frequency domain process.	Understand	CO 2	AEC508.08

S. No	QUESTION	Blooms Taxonomy Level	Course Outcome	Course learning Outcome
	PART-C (PROBLEM SOLVING AND CRITICAL THINKING QUESTIONS)			
1	(a) What is the objective of image enhancement? Define spatial domain. Define point processing. (b) Use 4x4 Image For a given image find (i) Digital Negative of image/Negation, (ii) Bit plane Slicing by using concept on Image Enhancement in Spatial domain	Apply	CO 2	AEC508.05
2	Apply Contrast Stretching techniques on 3-bit gray level image of size 4x4: if i=0 1 2 3 4 5 6 7, n_i =0 4 4 1 2 2 3 0 , calculate l, different l values ,where l=gray level, m=0 to 7	Understand	CO 2	AEC508.06
3	Five Steps for filtering in frequency domain to evaluating different filters for image smoothing and image sharpening with example	Apply	CO 2	AEC508.07
4	Consider a 3x3 spatial Mask that average the four closest neighbours of a point (x,y) but excludes point itself from average F(x,y)=F(x,y) .Find the equivalent filter ,H(u,v) in the frequency domain.	Understand	CO 2	AEC508.08
5	Explain how Laplacian is implemented in frequency domain.	Apply	CO 2	AEC508.09
6	Expression for 2-D IHPF, expression for BHPF, expression for GHPF with sketches. Explain their usefulness in image enhancement.	Apply	CO 2	AEC508.05
7	Write about smoothing spatial filters. What is meant by the gradiant and the laplacian? discuss their role in image enhancement.	Understand	CO 2	AEC508.06
8	How does the spatial filter with name order static filter (non-linear filter)or median filter work?	Apply	CO 2	AEC508.07
9	Expression for Butterworth low pass filter in frequency domain and discuss. Description of homomorphic filtering	Apply	CO 2	AEC508.08
10	Perform Histogram equalization of the following 8x8 image the gray level distribution of the image is given below: Gray level (r_k)= 0 1 2 3 4 5 6 7, Number of pixels(p_k)=8 10 10 2 12 16 9 2 , calculate Y_k , p_k, p_m, c_m , L and number of pixels.	Understand	CO 2	AEC508.09
	UNIT-III IMAGE RESTORATION			
	PART-A(SHORT ANSWER QUESTIONS)			
1	Explain about gray level interpolation.	Remember	CO 3	AEC508.10
2	Explain about Wiener filter used for image restoration.	Remember	CO 3	AEC508.10
3	Explain Mean filters.	Remember	CO 3	AEC508.11
4	Explain the Order-Statistic Filters.	Remember	CO 3	AEC508.12
5	Explain the Adaptive Filters.	Understand	CO 3	AEC508.13
6	Explain a simple Image Formation Model.	Understand	CO 3	AEC508.10
7	Write brief notes on inverse filtering.	Remember	CO 3	AEC508.11
8	Obtain the method of Least Mean Squares Filtering (Wiener) for image restoration	Remember	CO 3	AEC508.12
9	Explain Iterative deterministic approaches to restoration Constrained least squares iteration and Least squares iteration	Understand	CO 3	AEC508.13
10	Explain interactive restoration	Remember	CO 3	AEC508.10
11	Explain constrained least square restoration, interactive restoration	Remember	CO 3	AEC508.11
12	Explain a Model of the Image Degradation/Restoration Process.	Remember	CO 3	AEC508.12

S. No	QUESTION	Blooms Taxonomy Level	Course Outcome	Course learning Outcome
13	Explain Contra harmonic mean filter and Median filter	Remember	CO 3	AEC508.13
14	Explain image enhancement and image restoration	Understand	CO 3	AEC508.10
15	Explain Midpoint filter with example	Understand	CO 3	AEC508.11
16	How a degradation process is modeled?	Remember	CO 3	AEC508.10
17	What is inverse filtering?	Remember	CO 3	AEC508.11
18	What is meant by blind image restoration?	Understand	CO 3	AEC508.10
19	Present a note on weight parameter.	Understand	CO 3	AEC508.13
20	What are the three methods of estimating the degradation function?	Understand	CO 3	AEC508.10
	PART-B (LONG ANSWER QUESTIONS)			
1	Explain a Model of the Image Degradation/Restoration Process.	Understand	CO 3	AEC508.10
2	Explain about the restoration filters used when the image degradation is due to noise only.	Analyze	CO 3	AEC508.11
3	Enumerate the differences between the image enhancement and image restoration.	Apply	CO 3	AEC508.12
4	Explain about iterative nonlinear restoration using the Lucy–Richardson algorithm.	Analyze	CO 3	AEC508.13
5	Explain the method of least mean squares filtering for image restoration.	Understand	CO 3	AEC508.10
6	Explain model of image degradation/restoration process with a block diagram.	Apply	CO 3	AEC508.11
7	Explain the method of constrained least squares filtering for image restoration.	Understand	CO 3	AEC508.12
8	Write about noise probability density functions for all noise models.	Analyze	CO 3	AEC508.13
9	Explain three principle ways to estimate the degradation function for use in image restoration.	Analyze	CO 3	AEC508.10
10	Explain notch reject filters.	Understand	CO 3	AEC508.11
11	Enumerate the differences between the image enhancement and image restoration.	Understand	CO 3	AEC508.10
12	Explain how Wiener filter used for image restoration.	Analyze	CO 3	AEC508.10
13	Explain Arithmetic mean filter	Understand	CO 3	AEC508.10
14	Explain different types of restoration filters.	Understand	CO 3	AEC508.11
15	Write about types of Order-Statistic filters.	Understand	CO 3	AEC508.11
16	Write about component image observation model. b) Discuss about Erlang noise.	Understand	CO 3	AEC508.12
17	Explain about DAMMER and Weight	Understand	CO 3	AEC508.13
18	Discuss in detail the image restoration using inverse filtering.	Analyze	CO 3	AEC508.11
19	Discuss about constrained and unconstrained restorations.	Understand	CO 3	AEC508.13
20	Describe constrained least square filtering technique for image restoration and derive its transfer function.	Understand	CO 3	AEC508.12
	PART-C (PROBLEM SOLVING AND CRITICAL THINKING QUESTIONS)			
1	Explain three principle ways to estimate the degradation function for use in image restoration.	Apply	CO 3	AEC508.10
2	Explain about iterative nonlinear restoration using the lucy-richardson algorithm.	Apply	CO 3	AEC508.11
3	Derive the expression for observed image when the degradations are linear position invariant.	Understand	CO 3	AEC508.12
4	Explain Wiener smoothing filter	Apply	CO 3	AEC508.13

S. No	QUESTION	Blooms Taxonomy Level	Course Outcome	Course learning Outcome
5	Describe constrained least square filtering technique for image restoration and derive its transfer function.	Apply	CO 3	AEC508.10
6	Discuss and Explain , Relation with inverse filtering and Iterative Wiener filters	Understand	CO 3	AEC508.11
7	How can we obtain the notch filter that pass rather than suppressing the frequency in notch area?	Apply	CO 3	AEC508.12
8	Discuss about a Model of the Restoration Process. How image is degraded ,restoration is an objective process and criteria	Apply	CO 3	AEC508.10
9	Explain about Wiener filter used for image restoration.	Understand	CO 3	AEC508.11
10	Describe with mathematical model, both constrained and unconstrained restoration	Apply	CO 3	AEC508.12
UNIT-IV IMAGE SEGMENTATION				
PART-A(SHORT ANSWER QUESTIONS)				
1	Write about edge detection.	Remember	CO 4	AEC508.14
2	Explain about fidelity criterion	Remember	CO 4	AEC508.15
3	Explain their role in segmentation	Understand	CO 4	AEC508.16
4	What are the derivative operators useful in image segmentation?	Understand	CO 4	AEC508.14
5	What is thresholding?	Remember	CO 4	AEC508.15
6	Explain about global thresholding	Remember	CO 4	AEC508.16
7	Explain Image segmentation detection of discontinuities	Understand	CO 4	AEC508.14
8	Explain Opening and closing the hit and miss transformation.	Understand	CO 4	AEC508.15
9	Explain edge linking and boundary detection	Remember	CO 4	AEC508.16
10	What are the importance of Image Segmentation and Morphological operation	Remember	CO 4	AEC508.14
11	Explain A Simple edge model	Remember	CO 4	AEC508.15
12	Why edge detection is a non-trivial task	Understand	CO 4	AEC508.16
13	Explain Thresholding ,linking and Edge Thinning	Remember	CO 4	AEC508.14
14	Discuss categorizing thresholding Methods	Remember	CO 4	AEC508.15
15	What are the advantages of region growing	Understand	CO 4	AEC508.16
16	Explain the threshold selection based on boundary characteristics	Remember	CO 4	AEC508.14
17	Distinguish Dilation and Erosion : opening and closing	Remember	CO 4	AEC508.15
18	Discuss Combining dilation and erosion with example	Understand	CO 4	AEC508.16
19	Explain Strel function and erosion with suitable examples	Remember	CO 4	AEC508.14
20	Explain morphological image processing with dilation and erosion	Remember	CO 4	AEC508.15
PART-B (LONG ANSWER QUESTIONS)				
1	What are the derivative operators useful in image segmentation? Explain their role in segmentation.	Understand	CO 4	AEC508.14
2	Explain about the edge linking procedures.	Remember	CO 4	AEC508.15
3	What is thresholding? Explain about global thresholding.	Understand	CO 4	AEC508.16
4	Explain about region based segmentation.	Remember	CO 4	AEC508.14
5	Discuss in detail about region based segmentation	Understand	CO 4	AEC508.15
6	Explain the closing operation in image morphology with examples?	Understand	CO 4	AEC508.16
7	Discuss the Strel function, erosion with examples	Remember	CO 4	AEC508.14
8	Combining dilation and erosion with suitable examples	Remember	CO 4	AEC508.15
9	Explain region oriented segmentation	Remember	CO 4	AEC508.16

S. No	QUESTION	Blooms Taxonomy Level	Course Outcome	Course learning Outcome
10	Sketch morphological image processing of dilation erosion, hit and mis	Understand	CO 4	AEC508.14
11	Explain about basic adaptive thresholding process used in image segmentation.	Remember	CO 4	AEC508.14
12	Explain in detail the threshold selection based on boundary characteristics.	Remember	CO 4	AEC508.15
13	What are the derivative operators useful in image segmentation?	Understand	CO 4	AEC508.16
14	Determined the Global processing via the Hough Transform for edge linking	Understand	CO 4	AEC508.14
15	Explain about the Global processing via graph-theoretic techniques for edge linking	Remember	CO 4	AEC508.15
16	Explain about Region Splitting and Merging with an example	Understand	CO 4	AEC508.16
17	Write about the importance of Hit-or-Miss morphological transformation operation on a digital binary image	Remember	CO 4	AEC508.14
18	Determined the opening operation in image morphology with examples?	Remember	CO 4	AEC508.15
19	Discuss morphological image processing dilation and erosion	Remember	CO 4	AEC508.16
20	What is Hit-or-Miss morphological transformation? Explain their role in segmentation	Remember	CO 4	AEC508.14
PART-C (PROBLEM SOLVING AND CRITICAL THINKING QUESTIONS)				
1	What are the conditions of Region Split justify below condition : max{g(x,y)}-min{g(x,y)	Understand	CO 4	AEC508.14
2	What are the conditions of Region margin justify below condition : max{g(x,y)}-min{g(x,y)	Remember	CO 4	AEC508.15
3	What are the conditions of Split and merge justify below condition : max{g(x,y)}-min{g(x,y)	Understand	CO 4	AEC508.16
4	What are the k-means and image Segmentation and Computerphile	Understand	CO 4	AEC508.14
5	Discuss Dilation, Erosion opening and closing with suitable example of Dilation verify perfect match ,some match and no match	Remember	CO 4	AEC508.15
6	Evaluate Hit-and -Miss morphological transformation how to pixels are removed	Understand	CO 4	AEC508.16
7	Given 6x6 image A and element B {1 1 1} structuring (i)compute A dilated by B (ii) A^1 eroded by B	Understand	CO 4	AEC508.14
8	Suppose two discrete 1-D functional are represented by the sequences f={5,7,11, 8,2,6,8,9,7,4,3}, h={1,2,1}. Compute dilation and erosion	Understand	CO 4	AEC508.14
9	Suppose two discrete 1-D functional are represented by the sequences f={5,7,11, 8,2,6,8,9,7,4,3}, h={1,2,1}. Compute opening and closing.	Remember	CO 4	AEC508.15
10	What is Half transform how it is used for edge linking verify how to change a and b with y=ax+b.	Understand	CO 4	AEC508.16

S. No	QUESTION	Blooms Taxonomy Level	Course Outcome	Course learning Outcome
UNIT-V IMAGE COMPRESSION				
PART-A(SHORT ANSWER QUESTIONS)				
1	Define image compression.	Understand	CO 5	AEC508.17
2	Explain about fidelity criterion.	Understand	CO 5	AEC508.18
3	Explain LZW coding with an example	Understand	CO 5	AEC508.19
4	Explain the concept of bit plane coding method	Remember	CO 5	AEC508.17
5	Explain about lossless predictive coding.	Remember	CO 5	AEC508.18
6	Explain about lossy predictive coding	Understand	CO 5	AEC508.19
7	Explain The Channel Encoder and Decoder	Remember	CO 5	AEC508.17
8	Distinguish between Huffman coding Variable-Length Coding	Understand	CO 5	AEC508.18
9	Explain Arithmetic coding procedure and Bit-plane decomposition:	Understand	CO 5	AEC508.19
10	Sketch lossless predictive coding model	Remember	CO 5	AEC508.17
11	Explain Arithmetic Encoding procedures	Remember	CO 5	AEC508.17
12	Explain transmission of a message with example	Understand	CO 5	AEC508.18
13	Explain average code length, entropy and efficiency	Understand	CO 5	AEC508.19
14	Explain Shannon-Fanon Coding with examples	Remember	CO 5	AEC508.17
15	Explain JPEG is better than a Raw free? .	Understand	CO 5	AEC508.18
16	Explain Schematic diagram of Data Compression Procedure	Understand	CO 5	AEC508.19
17	Explain Lossless compression – coding	Remember	CO 5	AEC508.17
18	Explain Data Compression and Data Redundancy	Understand	CO 5	AEC508.18
19	Draw & Explain block diagram of Lossy Compression	Understand	CO 5	AEC508.19
20	Draw & Explain block diagram of Lossless Compression	Remember	CO 5	AEC508.17
PART-B (LONG ANSWER QUESTIONS)				
1	Explain about the redundancies in a digital image.	Remember	CO 5	AEC508.17
2	Explain about image compression models.	Remember	CO 5	AEC508.18
3	Explain the concept of bit plane coding method.	Understand	CO 5	AEC508.19
4	Explain about lossless predictive coding.	Apply	CO 5	AEC508.17
5	Explain about lossy predictive coding.	Remember	CO 5	AEC508.18
6	Explain about wavelet coding.	Understand	CO 5	AEC508.19
7	Explain a method of generating variable length codes with an example	Understand	CO 5	AEC508.17
8	Explain arithmetic encoding process with an example	Remember	CO 5	AEC508.18
9	Explain with a block diagram about transform coding system	Understand	CO 5	AEC508.19
10	List out and explain in detail about the image compression	Remember	CO 5	AEC508.17
11	Discuss in detail about JPEG compression standard and the steps involved in JPEG compression	Understand	CO 5	AEC508.18
12	Explain a method of generating variable length codes with an example.	Remember	CO 5	AEC508.17
13	Explain arithmetic encoding process with an example.	Understand	CO 5	AEC508.18
14	Explain LZW coding with an example.	Understand	CO 5	AEC508.19
15	Explain about JPEG compression standard and the steps involved in JPEG compression.	Understand	CO 5	AEC508.17
16	Discuss Redundancies and their removal methods with examples	Understand	CO 5	AEC508.18
17	Explain source encoder and decoder	Understand	CO 5	AEC508.19
18	Evaluate error free compression and lossy compression	Understand	CO 5	AEC508.17
19	Discuss JPEG 2000 standard with merits and demerits	Understand	CO 5	AEC508.18

S. No	QUESTION	Blooms Taxonomy Level	Course Outcome	Course learning Outcome
20	Draw and Explain A transform coding system	Understand	CO 5	AEC508.19
PART-C (PROBLEM SOLVING AND CRITICAL THINKING QUESTIONS)				
1.	Consider the transmission of a message "IARE." comprising a sting of characters with probability A -0.3, R-0.3, E-0.2, I-0.1,'.'-0.1	Remember	CO 5	AEC508.17
2.	By using Arithmetic Decoding procedure, decode the message 0.572 given the coding model. Symbol=! C E, Probability=0.1, 0.4 , 0.5.	Understand	CO 5	AEC508.18
3.	Determine and find out arithmetic coding , using this expression ,P(A)=0.5, P(B)=0.25, P(C)=0.25 .	Understand	CO 5	AEC508.19
4.	Decode message 0.572, given the coding model P(C)=0.4, P(E)=0.5, P(!)=0.1	Remember	CO 5	AEC508.17
5.	Consider a Source with 7 messages having probabilities 0.25, 0.25,0.125,0.125,0.125,0.0625, 0.0625.Find average code length, entropy and efficiency	Understand	CO 5	AEC508.18
6.	Determine codeword, word length and code length using Huffman coding: x1=0.4, x2=0.19, x3=0.16, x4=0.15, x5=0.15.	Understand	CO 5	AEC508.19
7.	A six symbol alphabet where the probability of each symbol is tabulated below ,Symbol(Xi)= A B C D E F : Probability of occurring P(Xi) =0.30 0.25 0.20 0.12 0.08 0.05 verify Shannon-Fanon Coding	Remember	CO 5	AEC508.17
8.	A six symbol alphabet where the probability of each symbol is tabulated below ,Symbol (Xi)= g h i j k l : Probability of occurring P(Xi) =0.30 0.25 0.20 0.12 0.08 0.05 verify Run length coding	Understand	CO 5	AEC508.18
9.	Discuss Quantization vs. compression and verify merits and demerits	Understand	CO 5	AEC508.19
10.	Why JPEG is better than a Raw free? What are the merits and de-merits.	Remember	CO 5	AEC508.17

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