INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

ELECTRICAL AND ELECTRONICS ENGINEERING

DEFINITIONS AND TERMINOLOGY QUESTION BANK

Course Title	FUNDAMENTALS OF IMAGE PROCESSING				
Course Code	AEC552				
Programme	B.Tech				
Semester	VII	EEE			
Course Type	Open Elective -II				
Regulation	IARE - R16				
Course Structure	**Theory**			**Practical**	
	Lectures	Tutorials	Credits	Laboratory	Credits
	3		3	-	-
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OBJECTIVES:

I	Understand the image fundamentals and the relationship between pixels.
II	Understand the image enhancement techniques in spatial domain and frequency domain.
III	Analyze the image restoration technique from degraded image using various filtering techniques.
IV	Design segmentation of the image for boundary detection.
V	Differentiate redundancy techniques and apply for image compression.

DEFINITIONS AND TERMINOLOGY QUESTION BANK

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
UNIT-I						
1	Define Pixel or Pel.	The resulting image of sampling and quantization is considered a matrix of real numbers. By what name(s) the element of this matrix array is called	Remember	CO1	CLO 3	AEC552.03
2	Define Image?	An image may be defined as two dimensional light intensity function f(x, y) where x and y denote spatial co-ordinate and the amplitude or value of f at any point (x, y) is called intensity or grayscale or brightness of the image at that point.	Remember	CO1	CLO 1	AEC552.01

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
3	Define Image element or Picture element or Pixel or Pel.	Sampling and Quantization of an image f(x, y) forms a matrix of real numbers and each element of this matrix array is commonly known as Image element or Picture element or Pixel or Pel.	Remember	CO1	CLO 2	AEC552.02
4	Define Image acquisition	Image acquisition is the first process in image processing. Note that acquisition could be as simple as being given an image that is already in digital form. Generally, the image acquisition stage involves preprocessing, such as scaling	Remember	CO1	CLO 3	AEC552.03
5	What is Dynamic Range?	The range of values spanned by the gray scale is called dynamic range of an image. Image will have high contrast, if the dynamic range is high and image will have dull washed out gray look if the dynamic range is low.	Remember	CO1	CLO 4	AEC552.04
6	Why In Quantization Process if the gray levels also are integers the Digital image.	The Digital image then becomes a 2-D function whose coordinates and amplitude values are integers	Remember	CO1	CLO 1	AEC552.01
7	Define high contrast	When in an Image an appreciable number of pixels exhibit high dynamic range, the image will have high contrast.	Understand	CO1	CLO 1	AEC552.01
8	Define Brightness?	Brightness of an object is the perceived luminance of the surround. Two objects with different surroundings would have identical luminance but different brightness.	Understand	CO1	CLO 2	AEC552.02
9	Define Grid	The sampling points are ordered in the plane and their relation is called a Grid.	Remember	CO1	CLO 3	AEC552.03
10	Define Contrast	It is defined as the difference in intensity between the highest and lowest intensity levels in an image	Remember	CO1	CLO 4	AEC552.04
11	What is Quantisation?	The transition between continuous values of the image function and its digital equivalent is called Quantisation.	Remember	CO1	CLO 1	AEC552.01
12	What do you mean by Gray level?	Gray level refers to a scalar measure of intensity that ranges from black to grays and finally to white.	Remember	CO1	CLO 2	AEC508.02
13	What is Sensor Strips?	A geometry consisting of in-line arrangement of sensors for image acquisition/ Sensor strips are very common next to single sensor and use in-line arrangement.	Remember	CO1	CLO 3	AEC552.03
14	What do you meant by Color model?	A Color model is a specification of 3D-coordinates system and a subspace within that system where each color is represented by a single point.	Remember	CO1	CLO 4	AEC552.04
15	What is meant by pixel?	A digital image is composed of a finite number of elements each of which has a particular location or value. These elements are referred to as pixels or image elements or picture elements or pels elements.	Understand	CO1	CLO 1	AEC552.01
16	What is Computerized Axial Tomography?	Industrial computerized axial tomography is based on image acquisition using sensor strips.	Understand	CO1	CLO 2	AEC552.02

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
17	What is digitization process?	The digitization process i.e. the digital image has M rows and N columns, requires decisions about values for M, N, and for the number, L, of gray levels allowed for each pixel. The value M and N	Understand	CO1	CLO 3	AEC552.03
18	Define Digital image?	When x, y and the amplitude values of f all are finite discrete quantities, we call the image as digital image.	Understand	CO1	CLO 4	AEC552.04
19	Define Monochromatic Image Size	A typical size comparable in quality to monochromatic TV image is of size A normal T.V have 512 x 512 resolution	Understand	CO1	CLO 1	AEC552.01
20	What is Interpretation	The interpretation is called the assigning meaning to recognized object.	Understand	CO1	CLO 2	AEC552.02
21	What is dynamic range	The range of values spanned by the gray scale is called or The valued spanned in gray scale image are depicted using dynamic range values.	Understand	CO1	CLO 3	AEC552.03
22	What is pixel?	Pixel is the elements of a digital image or An Image is a collection of individual points referred as pixel, thus a Pixel is the element of a digital image.	Remember	CO1	CLO 4	AEC552.04
23	Define Amplitude of image	An image is considered to be a function of a(x,y), where a represents: or The image is a collection of dots with a definite intensity or amplitude.	Remember	CO1	CLO 1	AEC552.01
24	Define Digital	Digital image processing is more flexible and agile techniques as it is fast, accurate and reliable.	Understand	CO1	CLO 2	AEC552.02
25	Define Brightness	The spatial coordinates of a digital image (x,y) are proportional to or The Brightness levels are distributed over the spatial area. Hence, the spatial coordinates are proportional to brightness levels.	Understand	CO1	CLO 3	AEC552.03
26	The number of grey values are integer powers of	The gray values are interpreted as the power of number of colors. In monochromatic image the number of colors is 2.	Understand	CO1	CLO 4	AEC552.04
27	What are the Steps in image processing?	Image acquisition-> Image enhancement->Image restoration->Color image processing->Wavelets and multi resolution processing->Compression->Morphological processing->Segmentation->Representation & description->Object recognition.	Remember	CO1	CLO 1	AEC552.01
28	What are the steps involved in DIP?	1. Image Acquisition 2. Preprocessing 3. Segmentation 4. Representation and Description 5. Recognition and Interpretation	Remember	CO1	CLO 2	AEC552.02
29	What is Sampling?	The output of the most sensors is a continuous waveform and the amplitude and spatial behavior of such waveform are related to the physical phenomenon being sensed.	Remember	CO1	CLO 3	AEC552.03
30	What is Quantization?	To convert a continuous sensed data into Digital form	Understand	CO1	CLO 4	AEC552.04
31	Define Sampling and Quantization	To convert a continuous sensed data into Digital form	Understand	CO1	CLO 1	AEC552.01

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
32	Define Coordinates	An image may be continuous in the x- and y-coordinates or in amplitude, or in both.	Understand	CO1	CLO 2	AEC552.02
33	Define Amplitude	To convert a continuous image f(x, y) to digital form, we have to sample the function in	Understand	CO1	CLO 3	AEC552.03
34	How could be Sampling defined?	For a continuous image f(x, y), Digitizing the coordinate values	Understand	CO1	CLO 4	AEC552.04
35	Define Sampling method	Sampling is the method of digitizing the coordinate values of the image.	Remember	CO1	CLO 1	AEC552.01
36	For a continuous image f(x, y), Quantization is defined as	Digitizing the amplitude values/ Sampling is the method of digitizing the amplitude values of the image.	Remember	CO1	CLO 2	AEC552.02
37	How is sampling been done when an image is generated by a single sensing element combined with mechanical motion?	The number of mechanical increments when the sensor is activated to collect data. When an image is generated by a single sensing element along with mechanical motion, the output data is quantized by dividing the gray-level scale into many discrete levels.	Remember	CO1	CLO 3	AEC552.03
38	How does sampling gets accomplished with a sensing strip being used for image acquisition?	The number of sensors in the strip establishes the sampling limitations in one image direction and mechanical motion in the other direction	Understand	CO1	CLO 4	AEC552.04
39	How sampling is accomplished when a sensing array is used for image acquisition?	The number of sensors in the sensing array defines the limits of sampling in both directions	Understand	CO1	CLO 1	AEC552.01
40	What is the relations of The number of samples and The discrete gray levels?	The quality of a digital image is determined mostly by the number of samples and discrete gray levels used in sampling and quantization.	Understand	CO1	CLO 2	AEC552.02
		UNIT-II				
1	What is Spatial Domain?	The section of the real plane spanned by the coordinates of an image is called the Spatial Domain	Understand	CO2	CLO 5	AEC552.05
2	Define Contrast	The difference is intensity between the highest and the lowest intensity levels in an image is Contrast.	Remember	CO2	CLO 6	AEC552.06
3	Specify the objective of image enhancement technique	The objective of enhancement technique is to process an image so that the result is more suitable than the original image for a particular application.	Remember	CO2	CLO 7	AEC552.07
4	Define additivity	The property indicating that the output of a linear operation due to the sum of two inputs is same as performing the operation on the inputs individually and then summing the results is called/ This property is called additivity.	Remember	CO2	CLO 8	AEC552.08
5	Define two categories of image	i) Spatial domain refers to image plane itself & approaches in this category are	Understand	CO2	CLO 9	AEC552.09

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
	enhancement	based on direct manipulation of picture image. ii) Frequency domain methods based on modifying the image by fourier transform.				
6	Define Subtraction	Enhancement of differences between images is based on the principle of is called Subtraction.	Understand	CO2	CLO 5	AEC552.05
7	What is contrast stretching?	Contrast stretching reduces an image of higher contrast than the original by darkening the levels below m and brightening the levels above m in the image.	Remember	CO2	CLO 6	AEC552.06
8	Define Mask mode radiography	A commercial use of Image Subtraction is called Mask mode radiography.	Remember	CO2	CLO 7	AEC552.07
9	What is grey level slicing?	Highlighting a specific range of grey levels in an image often is desired. Applications include enhancing features such as masses of water in satellite imagery and enhancing flaws in x-ray images	Remember	CO2	CLO 8	AEC552.08
10	Define Masking	Region of Interest (ROI) operations is commonly called as Masking.	Understand	CO2	CLO 9	AEC552.09
11	Define image subtraction.	The difference between 2 images f(x,y) and h(x,y) expressed as g(x,y)=f(x,y)-h(x,y) is obtained by computing the difference between all pairs of corresponding pixels from f and h.	Understand	CO2	CLO 5	AEC552.05
12	Define False Contouring	False Contouring is the effect caused by the use of an insufficient number of intensity levels in smooth areas of a digital image.	Remember	CO2	CLO 6	AEC552.06
13	What is the purpose of image averaging?	An important application of image averaging is in the field of astronomy, where imaging with very low light levels is routine, causing sensor noise frequently to render single images virtually useless for analysis.	Remember	CO2	CLO 7	AEC552.07
14	What are the applications of image multiplication?	Pixelation .Because Pixelation deals with enlargement of pixels.	Remember	CO2	CLO 8	AEC552.08
15	What is meant by masking?	Mask is the small 2-D array in which the values of mask co-efficient determine the nature of process. The enhancement technique based on this type of approach is referred to as mask processing	Remember	CO2	CLO 9	AEC552.09
16	Define Single Pixel Operation	The procedure done on a digital image to alter the values of its individual pixels is. It is expressed as a transformation function T, of the form s=T(z) , where z is the intensity.	Understand	CO2	CLO 5	AEC552.05
17	Define histogram.	The histogram of a digital image with gray levels in the range [0, L-1] is a discrete function h(rk)=nk. rk-k th gray level; nk-number of pixels in the image	Understand	CO2	CLO 6	AEC552.06

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		having gray level rk.				
18	Define Tie points	Geometric Spacial Transformation, points whose locations are known precisely in input and reference images.	Understand	CO2	CLO 7	AEC552.07
19	Define sine wave	Electromagnetic waves can be visualised as a/ Electromagnetic waves are visualised as sinusoidal wave.	Understand	CO2	CLO 8	AEC552.08
20	What is a Median filter?	The median filter replaces the value of a pixel by the median of the gray levels in the neighborhood of that pixel.	Understand	CO2	CLO 9	AEC552.09
21	What is Soft X-Rays?	Soft X-Rays (low energy) are used for dental and chest scans.	Understand	CO2	CLO 5	AEC552.05
22	Name the different types of derivative filters	1. Perwitt operators 2. Roberts cross gradient operators 3. Sobel operators	Understand	CO2	CLO 6	AEC552.06
23	Define Brightness	Brightness is subjective descriptor of light perception that is impossible to measure.	Understand	CO2	CLO 7	AEC552.07
24	What are the types of noise models?	1. Guassian noise 2. Rayleigh noise 3. Erlang noise 4. Exponential noise 5. Uniform noise 6. Impulse noise	Understand	CO2	CLO 8	AEC552.08
25	Define Photon	Massless particle containing a certain amount of energy is called/ Each bundle of massless energy is called a Photon.	Understand	CO2	CLO 9	AEC552.09
26	What is Monochromatic light	Achromatic light is also called monochromatic light.(Light void of color)	Understand	CO2	CLO 5	AEC552.05
27	What is brightness embodies?	Brightness embodies the achromatic notion of intensity and is a key factor in describing color sensation.	Understand	CO2	CLO 6	AEC552.06
28	What is smoothing filter	Noise reduction is obtained by blurring the image using smoothing filter.	Understand	CO2	CLO 7	AEC552.07
29	What is Average of pixels	The output or response of a smoothing, linear spatial filter is simply the average of the pixels contained in the neighbourhood of the filter mask.	Understand	CO2	CLO 8	AEC552.08
30	What is the output of a smoothing, linear spatial filter?	The output or response of a smoothing, linear spatial filter is simply the average of the pixels contained in the neighbourhood of the filter mask.	Remember	CO2	CLO 9	AEC552.09
31	Define averaging filter.	Since the smoothing spatial filter performs the average of the pixels, it is also called as averaging filter.	Understand	CO2	CLO 5	AEC552.05
32	Define Sharp transitions of gray levels	Smoothing filter replaces the value of every pixel in an image by the average value of the gray levels. So, this helps in removing the sharp transitions in the gray levels between the pixels. This is done because, random noise typically consists of sharp transitions in gray levels.	Understand	CO2	CLO 6	AEC552.06
33	Define Blur edges	Edges, which almost always are desirable features of an image, also are characterized by sharp transitions in gray level. So, averaging filters have an undesirable side effect that they blur	Understand	CO2	CLO 7	AEC552.07

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		these edges.				
34	What is the disadvantage of using smoothing filter?	Blur edges	Understand	CO2	CLO 8	AEC552.08
35	What is smoothing spatial filters?	One of the applications of smoothing spatial filters is that, they help in smoothing the false contours that result from using an insufficient number of gray levels.	Understand	CO2	CLO 9	AEC552.09
36	Define Smoothing spatial filter	This is a smoothing spatial filter. This mask yields a so called weighted average, which means that different pixels are multiplied with different coefficient values. This helps in giving much importance to the some pixels at the expense of others.	Understand	CO2	CLO 5	AEC552.05
37	Define Box filter	A spatial averaging filter or spatial smoothening filter in which all the coefficients are equal is also called as box filter.	Understand	CO2	CLO 6	AEC552.06
38	Define Gross representation	An important application of spatial averaging is to blur an image for the purpose of getting a gross representation of interested objects, such that the intensity of the small objects blends with the background and large objects become easy to detect.	Understand	CO2	CLO 7	AEC552.07
39	What is the application of image blurring?	Gross representation	Understand	CO2	CLO 8	AEC552.08
40	What is nonlinear smoothing filters?	Order static filters are nonlinear smoothing spatial filters whose response is based on the ordering or ranking the pixels contained in the image area encompassed by the filter, and then replacing the value of the central pixel with the value determined by the ranking result.	Understand	CO2	CLO 9	AEC552.09
UNIT-III						
1	Define Image restoration	Steps in image processing: Image acquisition-> Image enhancement-> Image restoration-> Color image processing-> Wavelets and multi resolution processing-> Compression-> Morphological processing-> Segmentation-> Representation & description-> Object recognition.	Remember	CO3	CLO 10	AEC552.10
2	What is the step that is performed before color image processing in image processing?	Image restoration : Steps in image processing: Image acquisition-> Image enhancement-> Image restoration-> Color image processing-> Wavelets and multi resolution processing-> Compression->Morphological processing->Segmentation->Representation & description-> Object	Understand	CO3	CLO 11	AEC552.11

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		recognition.				
3	What is meant by Image Restoration?	Restoration attempts to reconstruct or recover an image that has been degraded by using a clear knowledge of the degrading phenomenon.	Remember	CO3	CLO 12	AEC552.12
4	Define Reseau Marks	Imaging systems having physical artefacts embedded in the imaging sensors produce a set of points called Reseau Marks.	Remember	CO3	CLO 13	AEC552.13
5	What are the two properties in Linear Operator?	1. Additivity 2. Homogenity	Remember	CO3	CLO 12	AEC552.12
6	How many number of steps are involved in image processing?	Steps in image processing: Image acquisition-> Image enhancement-> Image restoration-> Color image processing-> Wavelets and multi resolution processing-> Compression-> Morphological processing-> Segmentation-> Representation & description-> Object recognition.	Remember	CO3	CLO 10	AEC552.10
7	What is concept algebraic approach?	The concept of algebraic approach is to estimate the original image which minimizes a predefined criterion of performances.	Remember	CO3	CLO 11	AEC552.11
8	Define object recognition	Recognition is the process that assigns a label (e.g., "vehicle") to an object based on its descriptors. We conclude our coverage of digital image processing with the development of methods for recognition of individual objects	Remember	CO3	CLO 12	AEC552.12
9	What is contrast stretching, if $r_1=s_1$ and $r_2=s_2$	The transformation is a linear function that produces no changes in gray levels	Remember	CO3	CLO 13	AEC552.13
10	What are the two methods of algebraic approach?	1. Unconstraint restoration approach 2. Constraint restoration approach	Understand	CO3	CLO 10	AEC552.10
11	Define transformation-linear function	The locations of points (r_1,s_1) and (r_2,s_2) control the shape of the transformation function. If $r_1=s_1$ and $r_2=s_2$ then the transformation is a linear function that produces no changes in gray levels.	Understand	CO3	CLO 11	AEC552.11
12	How transformation becomes a thresholding function	The transformation becomes a thresholding function that creates a binary image i.e ., In contrast stretching, if $r_1=r_2$, $s_1=0$ and $s_2=L-1/$	Understand	CO3	CLO 12	AEC552.12
13	Define Gray-level interpolation	Gray-level interpolation deals with the assignment of gray levels to pixels in the spatially transformed image	Understand	CO3	CLO 13	AEC552.13
14	How to create a binary image	If $r_1=r_2$, $s_1=0$ and $s_2=L-1$,the transformation becomes a thresholding function that creates a binary image.	Understand	CO3	CLO 10	AEC552.10
15	What is meant by Noise probability	The spatial noise descriptor is the statistical behavior of gray level values	Remember	CO3	CLO 11	AEC552.11

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
	density function?	in the noise component of the model.				
16	Define Gray-level slicing	Highlighting a specific range of gray levels in an image often is desired in gray-level slicing. Applications include enhancing features such as masses of water in satellite imagery and enhancing flaws in X-ray images.	Understand	CO3	CLO 12	AEC552.12
17	Which one is the primary objective of sharpening of an image?	Highlight fine details in the image.	Understand	CO3	CLO 13	AEC552.13
18	What is image translation and scaling?	Image translation means reposition the image from one co-ordinate location to another along straight line path. Scaling is used to alter the size of the object or image (ie a co-ordinate system is scaled by a factor	Understand	CO3	CLO 10	AEC552.10
19	Define Image sharpening process	Image sharpening process is used in electronic printing.	Understand	CO3	CLO 11	AEC552.11
20	Define The second order derivative of a digital function	Must be zero in the flat areas i.e. areas of constant grey values. Must be nonzero at the onset of a gray- level step or ramp discontinuities. Must be zero along the gray-level ramps of constant slope.	Understand	CO3	CLO 12	AEC552.12
21	Why the restoration is called as unconstrained restoration?	In the absence of any knowledge about the noise „n", a meaningful criterion function is to seek an such that H approximates of in a least square sense by assuming the noise term is as small as possible. Where H = system operator. = estimated input image. g = degraded image	Understand	CO3	CLO 13	AEC552.13
22	Define Differentiation	We know that, in blurring the image, we perform the average of pixels which can be considered as integration. As sharpening is the opposite process of blurring, logically we can tell that we perform differentiation on the pixels to sharpen the image.	Understand	CO3	CLO 10	AEC552.10
23	What is Image differentiation?	Image differentiation enhances the edges, discontinuities and deemphasizes the pixels with slow varying gray levels.	Understand	CO3	CLO 11	AEC552.11
24	What are the three methods of estimating the degradation function?	1. Observation 2. Experimentation 3. Mathematical modeling. The simplest approach to restoration is direct inverse filtering, an estimate $F^{\wedge}(u,v)$ of the transform of the original image simply by dividing the transform of the degraded image $G^{\wedge}(u,v)$	Understand	CO3	CLO 12	AEC552.12
25	Give the difference between Enhancement and Restoration	Enhancement technique is based primarily on the pleasing aspects it might present to the viewer. For example: Contrast Stretching. Whereas Removal of image blur by applying a deblurrings function is considered a restoration	Understand	CO3	CLO 13	AEC552.13

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		technique.				
26	Define Slow varying gray values	We are interested in the behaviour of derivatives used in sharpening in the constant gray level areas i.e., flat segments, and at the onset and end of discontinuities, i.e., step and ramp discontinuities.	Understand	CO3	CLO 10	AEC552.10
27	What is sharpening spatial filters?	Highlighting the fine detail in an image or Enhancing detail that has been blurred because of some error or some natural effect of some method of image acquisition, is the principal objective of sharpening spatial filters.	Remember	CO3	CLO 10	AEC552.11
28	Sharpening is analogous to which of the following operations?	To spatial differentiation/ Smoothing is analogous to integration and so, sharpening to spatial differentiation.	Remember	CO3	CLO 12	AEC552.12
29	Which are the sharpening spatial filters using digital differentiation?	Sharpening spatial filters enhances edges and discontinuities like noise Sharpening spatial filters deemphasizes areas that have slowly varying gray-level values	Remember	CO3	CLO 13	AEC552.13
30	What is Image Negatives?	The negative of an image with gray levels in the range [0, L-1] is obtained by using the negative transformation, which is given by the expression. s = L-1-r Where s is output pixel r is input pixel	Understand	CO3	CLO 13	AEC552.13
31	Define Intensity	The principle objective of Sharpening, to highlight transitions is called intensity/ The principle objective of Sharpening, to highlight transitions is Intensity.	Understand	CO3	CLO 10	AEC552.10
32	Give the formula for negative and log transformation	Negative: $S=L-1-r$; Log: $S = c \log(1+r)$ Where c-constant and ≥ 0	Understand	CO3	CLO 11	AEC552.11
33	What is meant by bit plane slicing?	Instead of highlighting gray level ranges, highlighting the contribution made to total image appearance by specific bits might be desired. Suppose that each pixel in an image is represented by 8 bits. Imagine that the image is composed of eight 1-bit planes, ranging from bit plane 0 for LSB to bit plane-7 for MSB.	Understand	CO3	CLO 12	AEC552.12
34	Why blur is to be removed from images?	The blur is caused by lens that is improper manner, relative motion between camera and scene and atmospheric turbulence. It will introduce bandwidth reduction and make the image analysis as complex. To prevent the issues, blur is removed from the images.	Understand	CO3	CLO 13	AEC552.13
35	What is meant by Image Restoration?	Restoration attempts to reconstruct or recover an image that has been degraded by using a clear knowledge of the degrading phenomenon.	Understand	CO3	CLO 10	AEC552.10
36	What are the two properties in	Additivity and Homogenity	Remember	CO3	CLO 11	AEC552.11

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
	Linear Operator?					
37	How a degradation process is modeled?	A system operator H, which together with an additive white noise term _(x,y) a operates on an input image f(x,y) to produce a degraded image g(x,y).	Remember	CO3	CLO 12	AEC552.12
38	Define homogenity property in Linear Operator	The homogeneity property says that,the response to a constant multiple of any input is equal to the response to that input multiplied by the same constant.	Remember	CO3	CLO 13	AEC552.13
39	Define circulant matrix?	A square matrix, in which each row is a circular shift of the preceding row and the first row is a circular shift of the last row, is called circulant matrix.	Remember	CO3	CLO 10	AEC552.10
40	What is concept algebraic approach?	The concept of algebraic approach is to estimate the original image which minimizes a predefined criterion of performances.	Remember	CO3	CLO 11	AEC552.11
UNIT-IV						
1	What is Morphological processing	Morphological processing deals with tools for extracting image components that are useful in the representation and description of shape. The material in this chapter begins a transition from processes that output images to processes that output image attributes.	Remember	CO4	CLO 14	AEC552.14
2	What role does the segmentation play in image processing?	Deals with partitioning an image into its constituent parts or objects	Remember	CO4	CLO 15	AEC552.15
3	What is segmentation?	Segmentation is the process of portioning an image into its constitute regions or objects based on certain criteria. Image segmentation algorithms are based on either discontinuity principle or similarity principle.	Remember	CO4	CLO 15	AEC552.15
4	What is the Segmentation procedures	Segmentation procedures partition an image into its constituent parts or objects. In general, autonomous segmentation is one of the most difficult tasks in digital image processing. A rugged segmentation procedure brings the process a long way toward successful solution of imaging problems that require objects to be identified individually.	Understand	CO4	CLO 16	AEC552.16
5	What is Zero in flat segments	The derivations of digital functions are defined in terms of differences. The definition we use for first derivative should be zero in flat segments, nonzero at the onset of a gray level step or ramp and nonzero along the ramps.	Remember	CO4	CLO 15	AEC552.15
6	Write the applications of segmentation	Detection of isolated points. * Detection of lines and edges in an image.	Remember	CO4	CLO 14	AEC552.14
7	Define Nonzero response at onset	The derivations of digital functions are defined in terms of differences. The	Remember	CO4	CLO 15	AEC552.15

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
	of gray level step	definition we use for second derivative should be zero in flat segments, zero at the onset of a gray level step or ramp and nonzero along the ramps.				
8	What are the three types of discontinuity in digital image?	Points, lines and edges	Remember	CO4	CLO 15	AEC552.15
9	If f(x,y) is an image function of two variables, then the first order derivative of a one dimensional function, f(x) is:	f(x+1)-f(x): The first order derivative of a single dimensional function f(x) is the difference between f(x) and f(x+1). That is, $\partial f/\partial x = f(x+1)-f(x)$.	Understand	CO4	CLO 16	AEC552.16
10	How the derivatives are obtained in edge detection during formulation?	The first derivative at any in an image is obtained by using the magnitude of the gradient at that point. Similarly the second derivatives are obtained by using the laplacian.	Understand	CO4	CLO 14	AEC552.14
11	Define noise point.	Isolated point is also called as noise point.	Understand	CO4	CLO 15	AEC552.15
12	Write about linking edge points.	The approach for linking edge points is to analyze the characteristics of pixels in a small neighborhood (3x3 or 5x5) about every point (x,y)in an image that has undergone edge detection. All points that are similar are linked, forming a boundary of pixels that share some common properties.	Understand	CO4	CLO 15	AEC552.15
13	Define Thicker	We know that, the first order derivative is nonzero along the entire ramp while the second order is zero along the ramp. So, we can conclude that the first order derivatives produce thicker edges and the second order derivatives produce much finer edges.	Understand	CO4	CLO 16	AEC552.16
14	What are the two properties used for establishing similarity of edge pixels?	(1) The strength of the response of the gradient operator used to produce the edge pixel. (2) The direction of the gradient.	Understand	CO4	CLO 14	AEC552.14
15	What is Edges	Image Differentiation enhances Edges and other discontinuities.	Understand	CO4	CLO 15	AEC552.15
16	What is edge?	An edge isa set of connected pixels that lie on the boundary between two regions edges are more closely modeled as having a ramplike profile. The slope of the ramp is inversely proportional to the degree of blurring in the edge.	Understand	CO4	CLO 16	AEC552.16
17	Define Pixel Density	Image differentiation de-emphasizes areas with slowly varying intensities.	Understand	CO4	CLO 16	AEC552.16
18	Give the properties of the second derivative around an edge	The sign of the second derivative can be used to determine whether an edge pixel lies on the dark or light side of an edge. It produces two values for every edge in an image. x An imaginary straightline joining the extreme positive and negative	Understand	CO4	CLO 14	AEC552.14

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		values of the second derivative would cross zero near the midpoint of the edge				
19	Define Gradient Operator	First order derivatives of a digital image are based on various approximation of the 2-D gradient. The gradient of an image f(x,y) at location(x,y) is defined as the vector Magnitude of the vector is $\Delta f = mag(\Delta f) = [Gx^2 + Gy^2]^{1}$	Remember	CO4	CLO 15	AEC552.15
20	What is meant by object point and background point?	To execute the objects from the background is to select a threshold T that separates these modes. Then any point (x,y) for which f(x,y)>T is called an object point. Otherwise the point is called background point	Remember	CO4	CLO 14	AEC552.14
21	What is global threshold?	When Threshold T depends only on f(x,y) then the threshold is called global.	Remember	CO4	CLO 15	AEC552.15
22	Define region growing	Region growing is a procedure that groups pixels or subregions in to layer regions based on predefined criteria. The basic approach is to start with a set of seed points and from there grow regions by appending to each seed these neighbouring pixels that have properties similar to the seed.	Understand	CO4	CLO 15	AEC552.15
23	Specify the steps involved in splitting and merging	Split into 4 disjoint quadrants any region Ri for which P(Ri)=FALSE. Merge any adjacent regions Rj and Rk for which P(RjURk)=TRUE. Stop when no further merging or splitting is positive.	Understand	CO4	CLO 16	AEC552.16
24	What is Local threshold?	If Threshold T depends both on f(x,y) and p(x,y) is called local.	Understand	CO4	CLO 14	AEC552.14
25	What is dynamic or adaptive threshold?	If Threshold T depends on the spatial coordinates x and y the threshold is called dynamic or adaptive where f(x,y) is the original image	Remember	CO4	CLO 14	AEC552.14
26	How edges are linked through hough transform?	The edges are linked through hough transform by using intersecting of 2 lines equations. The straight line equation is y = mx+b. In polar coordinates $\rho = x\cos\theta + y\sin\theta$ where ρ & θ are the coordinates of parameter space. The hough transform of a straight line in the x,y space is a single point in ρ,θ space	Remember	CO4	CLO 15	AEC552.15
27	State the problems in region splitting and merging based image segmentation	Initial seed points – different set of initial seed point cause different segmented result. x Time consuming problem x This method is not suitable for color images and produce fault colors sometime. x Region growth may stop at any time when no more pixel satisfy the criteria.	Remember	CO4	CLO 14	AEC552.14
28	What are the factors affecting the accuracy of region growing?	The factors affecting the accuracy of region growing are like lightning variations, pixel's intensity value	Understand	CO4	CLO 15	AEC552.15
29	Define region splitting and merging	Region splitting and merging is a segmentation process in which an image is initially subdivided into a set of	Remember	CO4	CLO 14	AEC552.14

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		arbitrary ,disjoint regions and then the regions are merger and /or splitted to satisfy the basic conditions.				
30	What is Image Segmentation?	The segmentation algorithms can be divided into two broad categories based on the two important properties, namely, discontinuity and Similarity.	Remember	CO4	CLO 15	AEC552.15
31	What are the Image Segmentation Techniques	The various segmentation techniques based on (1) gray level discontinuity and (2) gray level similarity are well depicted in a graph	Remember	CO4	CLO 14	AEC552.14
32	What is the cause of ringing effect?	If your sampling rate does not include all frequencies in your image, ringing effect occurs.	Understand	CO4	CLO 15	AEC552.15
33	What problem occurs when the histogram has only one lobe?	When the image histogram has only one lobe then a threshold cannot be found.	Understand	CO4	CLO 14	AEC552.14
34	What problem occurs when the image has low luminance?	Then the histogram of the image is restricted to a small region of luminance intensity and uniform thresholding does not give good results.	Understand	CO4	CLO 15	AEC552.15
35	What are the advantages of the non-uniform thresholding?	Non-uniform thresholding solves the above mentioned problem, since it first modifies the histogram in order to be better distributed in all luminance values.	Understand	CO4	CLO 14	AEC552.14
36	What is the definition of the pixel neighborhood?	In many applications, it is important to check the connectedness of a region, something that it is done using the neighborhood definition.	Remember	CO4	CLO 15	AEC552.15
37	What is the definition of region connectedness?	A region R is called connected if any two pixels (xA, yA), (xB, yB) belonging to R.	Remember	CO4	CLO 14	AEC552.14
38	Segmentation is usually not perfect due to number of factors such as	Noise, Bad illumination	Remember	CO4	CLO 15	AEC552.15
39	What are the two approaches to segmentation?	Region based segmentation & edge segmentation	Understand	CO4	CLO 14	AEC552.14
40	Define closing	Dilation followed by erosion is called	Understand	CO4	CLO 15	AEC552.15
		UNIT-V				
1	What is the expanded form of JPEG?	Image compression is familiar (perhaps inadvertently) to most users of computers in the form of image file extensions, such as the jpg file extension used in the JPEG (Joint Photographic Experts Group) image compression standard.	Remember	CO5	CLO 17	AEC552.17
2	What is image compression?	Image compression refers to the process of redundancy amount of data required to represent the given quantity of information for digital image. The basis of reduction process is removal of redundant data	Understand	CO5	CLO 18	AEC552.18
3	What are two main types of Data compression?	Lossless compression can recover the exact original data after compression. It is used mainly for compressing database	Remember	CO5	CLO 19	AEC552.18

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		records, spreadsheets or word processing files, where exact replication of the original is essential.				
4	What is the need for Compression?	In terms of storage, the capacity of a storage device can be effectively increased with methods that compress a body of data on its way to a storage device and decompress it when it is retrieved.	Remember	CO5	CLO 17	AEC552.17
5	What is Data Compression?	Data compression requires the identification and extraction of source redundancy. In other words, data compression seeks to reduce the number of bits used to store or transmit information	Remember	CO5	CLO 17	AEC552.17
6	What are different Compression Methods?	Run Length Encoding (RLE) Arithmetic coding Huffman coding and Transform coding	Understand	CO5	CLO 18	AEC552.18
7	Define is coding redundancy	If the gray level of an image is coded in a way that uses more code words than necessary to represent each gray level, then the resulting image is said to contain coding redundancy.	Remember	CO5	CLO 19	AEC552.19
8	Define interpixel redundancy	The value of any given pixel can be predicted from the values of its neighbors.The information carried by is small. Therefore the visual contribution of a single pixel to an image is redundant. Otherwise called as spatial redundant geometric redundant or interpixel redundant. Eg: Run length coding	Remember	CO5	CLO 17	AEC552.17
9	What is run length coding?	Run-length Encoding, or RLE is a technique used to reduce the size of a repeating string of characters. This repeating string is called a run; typically RLE encodes a run of symbols into two bytes, a count and a symbol.	Understand	CO5	CLO 18	AEC552.18
10	Define compression ratio.	Compression Ratio = original size / compressed size	Remember	CO5	CLO 17	AEC552.17
11	Define psycho visual redundancy	In normal visual processing certain information has less importance than other information. So this information is said to be psycho visual redundant.	Remember	CO5	CLO 18	AEC552.18
12	Define encoder	Source encoder is responsible for removing the coding and interpixel redundancy and psycho visual redundancy. There are two components A) Source Encoder B) Channel Encoder	Understand	CO5	CLO 19	AEC552.19
13	Define source encoder	Source encoder performs three operations 1) Mapper -this transforms the input data into non-visual format. It reduces the interpixel redundancy.	Remember	CO5	CLO 17	AEC552.17
14	Define channel encoder	The channel encoder reduces reduces the impact of the channel noise by inserting redundant bits into the source encoded data. Eg: Hamming code	Understand	CO5	CLO 18	AEC552.18
15	What are the types of decoder?	Source decoder- has two components a) Symbol decoder- This performs inverse operation of symbol encoder. b) Inverse	Remember	CO5	CLO 19	AEC552.19

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		mapping- This performs inverse operation of mapper. Channel decoder- this is omitted if the system is error free				
16	What operations are performed by error free compression?	1) Devising an alternative representation of the image in which its interpixel redundant are reduced. 2) Coding the representation to eliminate coding redundancy	Understand	CO5	CLO 17	AEC552.17
17	What is Variable Length Coding?	Variable Length Coding is the simplest approach to error free compression. It reduces only the coding redundancy. It assigns the shortest possible codeword to the most probable gray levels.	Remember	CO5	CLO 18	AEC552.18
18	Define Huffman coding and mention its limitation	Huffman coding is a popular technique for removing coding redundancy.	Understand	CO5	CLO 19	AEC552.19
19	Define Block code	Each source symbol is mapped into fixed sequence of code symbols or code words. So it is called as block code	Remember	CO5	CLO 17	AEC552.17
20	Define instantaneous code	A code word that is not a prefix of any other code word is called instantaneous or prefix codeword	Remember	CO5	CLO 18	AEC552.18
21	Define uniquely decodable code	A code word that is not a combination of any other codeword is said to be uniquely decodable code.	Remember	CO5	CLO 19	AEC552.19
22	Define B2 code	Each code word is made up of continuation bit c and information bit which are binary numbers. This is called B2 code or B code. This is called B2 code because two information bits are used for continuation bits	Understand	CO5	CLO 17	AEC552.17
23	Define the procedure for Huffman shift coding	List all the source symbols along with its probabilities in descending order. Divide the total number of symbols into block of equal size. Sum the probabilities of all the source symbols outside the reference block.	Understand	CO5	CLO 17	AEC552.17
24	Define arithmetic coding	In arithmetic coding one to one corresponds between source symbols and code word doesn"t exist where as the single arithmetic code word assigned for a sequence of source symbols. A code word defines an interval of number between 0 and 1.	Understand	CO5	CLO 18	AEC552.18
25	What is bit plane Decomposition?	An effective technique for reducing an image"s inter pixel redundancies is to process the image"s bit plane individually.	Understand	CO5	CLO 19	AEC552.19
26	How effectiveness of quantization can be improved?	1. Introducing an enlarged quantization interval around zero, called a dead zero. 2. Adapting the size of the quantization intervals from scale to scale. In either case, the selected quantization intervals must be transmitted to the decoder with the encoded image bit stream	Remember	CO5	CLO 17	AEC552.17
27	What are the coding systems in JPEG?	1. A lossy baseline coding system, which is based on the DCT and is adequate for most compression application. 2. An extended coding system for greater	Remember	CO5	CLO 18	AEC552.18

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		compression, higher precision or progressive reconstruction applications. 3. A lossless independent coding system for reversible compression.				
28	What is JPEG?	The acronym is expanded as "Joint Photographic Expert Group". It is an international standard in 1992. It perfectly Works with color and grayscale images, Many applications e.g., satellite, medical	Remember	CO5	CLO 19	AEC552.19
29	What are the basic steps in JPEG?	The Major Steps in JPEG Coding involve: 1. DCT (Discrete Cosine Transformation) 2. Quantization 3. Zigzag Scan 4. DPCM on DC component 5. RLE on AC Components 6. Entropy Coding	Understand	CO5	CLO 17	AEC552.17
30	What is MPEG?	The acronym is expanded as "Moving Picture Expert Group". It is an international standard in 1992. It perfectly Works with video and also used in teleconferencing	Understand	CO5	CLO 18	AEC552.18
31	Define I-frame	I-frame is Intraframe or Independent frame. An I-frame is compressed independently of all frames. It resembles a JPEG encoded image. It is the reference point for the motion estimation needed to generate subsequent P and P-frame.	Understand	CO5	CLO 19	AEC552.19
32	Define P-frame	P-frame is called predictive frame. A P-frame is the compressed difference between the current frame and a prediction of it based on the previous I or P-frame	Understand	CO5	CLO 17	AEC552.17
33	Define B-frame	B-frame is the bidirectional frame. A B-frame is the compressed difference between the current frame and a prediction of it based on the previous I or P-frame or next P-frame. Accordingly the decoder must have access to both past and future reference frames.	Understand	CO5	CLO 18	AEC552.18
34	What is shift code?	The two variable length codes (Binary shift, Huffman Shift) are referred to as shift codes. A shift code is generated by i)Arranging probabilities of the source symbols are monotonically decreasing.	Understand	CO5	CLO 19	AEC552.19
35	What are the types of redundancy ?	i) Coding Redundancy ii) Interpixel Redundancy iii) Psychovisual Redundancy	Remember	CO5	CLO 17	AEC552.17
36	Define Psychovisual redundancy.	Certain information which has less relative importance than other information in normal visual processing are said to be psychovisually redundant information.	Remember	CO5	CLO 18	AEC552.18
37	What is image compression?	Image compression refers to the process of redundancy amount of data required to represent the given quantity of information for digital image. The basis of reduction process is removal of redundant data.	Remember	CO5	CLO 19	AEC552.19

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
38	What is Data Compression?	Data compression requires the identification and extraction of source redundancy. In other words, data compression seeks to reduce the number of bits used to store or transmit information.	Understand	CO5	CLO 17	AEC552.17
39	What are two main types of Data compression?	1. Lossless compression 2. Lossy compression	Understand	CO5	CLO 18	AEC552.18
40	What is the need for Compression?	In terms of communications, the bandwidth of a digital communication link can be effectively increased by compressing data at the sending end and decompressing data at the receiving end.	Remember	CO5	CLO 19	AEC552.19

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