INSTITUTE OF AERONAUTICAL ENGINEERING
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COMPUTER SCIENCE AND INFORMATION TECHNOLOGY

DEFINITION AND TERMINOLOGY

Course Title	**IMAGE PROCESSING**				
Course Code	AECC26				
Program	B.Tech				
Semester	IV	CSIT			
Course Type	Professional Elective-I				
Regulation	IARE - UG20				
Course Structure	Theory			Practical	
	Lecture	Tutorials	Credits	Laboratory	Credits
	3	-	3	-	-
Course Coordinator	Ms.B Lakshmi Prasanna , Assistant Professor				

COURSE OBJECTIVES:

The students will try to learn:

I	The fundamental concepts of digital image processing system and its components.
II	The image enhancement, segmentation and compression techniques in spatial and frequency domains
III	The processing steps included in colour image model construction and enhancement.
IV	The algorithms used to solve image processing problems to meet design specifications of various applications like Industry, medicine and defence.

COURSE OUTCOMES:

After successful completion of the course, students should be able to:

CO 1	**Interpret** the principles and terminology of digital image processing for describing the features of image.	Understand
CO 2	**Illustrate** mathematical tools used in image intensity transformations for quality enhancement.	Apply
CO 3	**Identify** image enhancement technique to improve the quality.	Apply
CO 4	**Apply** filters on spatial and frequency domains for restoring and reducing the noise in a given image.	Apply

CO 5	**Summarize** color models and transformation processing techniques for color image enhancement and compression.	Understand
CO 6	**Apply** region based morphological operations and edge- based image segmentation techniques for detection of objects in images to remove the imperfections in the structure of the image.	Apply

DEFINITION AND TERMINOLOGY:

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	MODULE I	
	INTRODUCTION	
1	**Define Pixel** Pixel is the smallest element of an image .	CO 1
2	**Define picture element** Picture element is the smallest discrete component of an image.	CO 1
3	**What is an image.** An image is an array, or a matrix, of square pixels arranged in columns and rows.	CO 1
4	**What is image processing** Image processing is a method to perform some operations on an image.	CO 1
5	**Define region** A region in an image is a group of connected pixels with similar properties.	CO 1
6	**What is Image acquisition** Image acquisition is the creation of a digitally encoded representation of the visual characteristics of an object	CO 1
7	**Define Dynamic Range** The range of values spanned by the gray scale is called dynamic range of an image .	CO 1
8	**Compare 2D and 3D images?** 2D is defined as having two axes to plot, usually the x-axis and y-axis., 3D indicates three aspects, which are plotted on the x-axis, y-axis and the z-axis..	CO 1
9	**Define high contrast** When in an Image anappreciable number of pixels exhibit high dynamic range, the image will have high contrast. .	CO 1
10	**What is meant by Grid** The sampling points are ordered in the Plane and their relation is called a Grid.	CO 1
11	**Define Contrast** It is defined as the difference in intensity between the highest and lowest intensity levels in an image	CO 1
12	**What is meanby Gray level?** Gray level refers to a scalar measure of Intensity that ranges from black to white.	CO 1
13	**Define SensorStrips?** The sensors for image acquisition/Sensor strips are commonly used for in-Line arrangement in imaging geometry.	CO 1

14	**What do you meant by Color model**	CO 1
	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.	
15	**Define Filter.**	CO 2
	Filtering is a technique for modifying or enhancing an image	
16	**Define scanner.**	CO 1
	Scanner is a device that optically scans images, printed text, handwriting or an object and converts it to a digital image.	
17	**What is digitization process?**	CO 1
	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.	
18	**Define analog image with examples**	CO 1
	Analog image is a continuous variation Examples of analog images are television images, photographs, paintings, and medical images.	
19	**What is a booster stage?**	CO 1
	The first stage lifts off the entire rocket vehicle system, therefore it is the most powerful stage and is known as the booster stage.	
20	**Define Interpretation**	CO 1
	The interpretation is called the assigning to recognize object.	
21	**What is the function of sensor**	CO 1
	A sensor is a device that detects and responds to some type of input from the physical environment.	
22	**Define acquisition**	CO 1
	It is defined as the action of retrieving an image from some source.	
23	**What is 4 adjacency**	CO 1
	Two pixels p and q with values from V are 4-adjacent if q is in the set N4(p).	
24	**Define Digital image**	CO 1
	Digital image can be defined by a two-dimensional array specifically arranged in rows and columns.	
25	**Define Brightness**	CO 2
	Brightness refers to the overall lightness or darkness of the image.	
26	**Define gray level resolution**	CO 1
	Gray Level Resolution can be defined as the total number of pixels in an image.	
27	**What 8 adjacency**	CO 1
	Two pixels p and q with values from V are 8-adjacent if q is in the set N8(p).	
28	**What are the steps Involved in DIP?**	CO 1
	1. Image Acquisition 2. Preprocessing 3.Segmentation 4. Representation and Description 5. Recognition and Interpretation	

29	**Define Sampling?** Sampling is the process of converting continuous time signal into a discrete time signal.	CO 1
30	**What is Quantization?** To convert a continuous sensed data into Digital form.	CO 2
31	**Define encoding** Encoding is the process of converting data from one form to another	CO 1
32	**What is mean by Coordinates?** To convert a continuous sensed data in to Digital form.	CO 1
33	**What is Quantization?** An image may be continuous in the x-and y-coordinates or in amplitude, or in both.	CO 1
34	**Define adjacency** Two pixels are connected if they are. Neighbors and their gray levels satisfy some specified criterion of similarity is called adjacency.	CO 1
35	**What is intensity value of a pixel** A pixel is a small block that represents the amount of gray intensity to be displayed for that particular portion of the image.	CO 1
36	**Write the difference between sampling and quantization** Sampling: It determines the spatial resolution of the digitized images. Quantization: It determines the number of grey levels in the digitized images.	CO 1
37	**What is mean by pixel connectivity** Pixel connectivity is the way in which pixels in 2-dimensional 3-dimensional images relate to their neighbors.	CO 1
38	**What is scanner** A scanner is a device that captures images from photographic prints, posters, magazine pages, and similar sources for computer editing and display	CO 1
39	**Define m- adjacency** m-adjacency is a combination of 4 and 8 adjacency	CO 1
40	**Define image geometry** The geometric shape which appears after a transformation has been applied to the pre image.	CO 1
MODULE II		
IMAGE ENHANCEMENT IN SPATIAL DOMAIN		
1	**What is Spatial Domain?** The section of the real plane spanned by the coordinates of an image is called the Spatial Domain	CO 3
2	**Define Contrast** The difference is intensity between the highest and the lowest intensity levels inan image is Contrast.	CO 3

3	**Specify the objective of image enhancement technique**	CO 3
	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.	
4	**Define additivity**	CO 3
	TThe 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.	
5	**List the two categories of Image enhancement**	CO 3
	i)direct manipulation of picture image.ii) Frequency domain methods based on modifying the image by FourierTransform.	
6	**Write properties of Haar Transform**	CO 3
	Image result for properties of haar transform The Haar transform is the simplest of the wavelet transforms. This transform cross-multiplies a function against the Haar wavelet with various shifts and stretches, like the Fourier transform cross-multiplies a function against a sine wave with two phases and many stretches.	
7	**What is contrast stretching?**	CO 3
	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.	
8	**Define Mask mode radiography**	CO 3
	A commercial use of Image Subtraction is called Mask mode radiography.	
9	**What is grey level slicing?**	CO 3
	Highlighting a specific range of grey levels in an image is called grey level slicing.	
10	**Define Masking**	CO 3
	Region of Interest (ROI) operations is Commonly called as Masking.	
11	**Define image subtraction.**	CO 3
	The difference between 2 images	
12	**State Walsh transform**	CO 3
	The Walsh-transform is and orthogonal transformation that decomposes a signal into a set of orthogonal, rectangular waveforms called Walsh functions.	
13	**What is image averaging?**	CO 3
	Image averaging is a technique that is often employed to enhance video images that have been corrupted by random noise.	
14	**Define image multiplication.**	CO 3
	The difference between 2 images .	
15	**What is meant by masking?.**	CO 3

	Mask is the small 2-D array in which the values of mask co-efficient determine the nature of process.	
16	**Define Single Pixel Operation.** The procedure done on a digital image to alter the values of its individual pixels.	CO 3
17	**What is histogram.** The histogram of a digital image with gray levels in the range	CO 3
18	**Define Tie points** Geometric Special Transformation, points whose locations are known Tie points of a images.	CO 3
19	**How Electromagnetic wave can be Visualized** Electromagnetic waves can be visualized as a/Electromagnetic waves are visualized as sinusoidal wave..	CO 3
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.	CO 3
21	**What is Soft X-Rays?** Soft X-Rays (low energy) are used for Dental and chest scans.	CO 3
22	**Name the different types of derivative filters** 1. Perwitt operators 2. Roberts cross gradient operators 3. Sobel operators	CO 3
23	**Define Brightness** Brightness is subjective descriptor of light perception that is impossible to measure.	CO 3
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	CO 3
25	**Define Photon** Mass less particle containing a certainamount of energy is called/ Each bundleof mass less energy is called a Photon.	CO 3
26	**What is Monochromaticlight** Light of a single wavelength is known as monochromatic light. .	CO 3
27	**What are brightness bodies?** Brightness embodies the achromatic notion of intensity and is a key factor in describing color sensation.	CO 3
28	**Define smoothing filter** Mass less particle containing a certainamount of energy is called/ Each bundleof mass less energy is called a Photon.	CO 3
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 neighborhood of the filter mask.	CO 3
30	**What is smoothing linear spatial filter?**	CO 3

	Smoothing linear spatial filter is the average of the pixels contained in the neighborhood of the filter mask.	
31	**Define averaging filter** Since the smoothing spatial filter forms the average of the pixels, it is also called as averaging filter.	CO 3
32	**What is the purpose of Sharp transitions of graylevels** 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.	CO 3
33	**Define Blur edges** Edges, which almost always are desirable features of an image, also are characterized by sharp transitions in gray level.	CO 3
34	**What are the disadvantage of using smoothing filter?** The disadvantage of using smoothing filter is Blur the edges.	CO 3
35	**Define smoothing spatial filters?** Smoothing filter is used for blurring and noise reduction in the image.	CO 3
36	**What is the function of sharpening filters** Sharpening filter can help emphasize details and enhance the edges of objects in an image.	CO 3
37	**Define Box filter** A spatial averaging filter or spatial smoothening filter in which all the coefficients are equal is also called asbox filter..	CO 3
38	**Write about hotelling transform** The Hotelling transform is a linear transformation of a set of n dimensional vectors that correlates the n coordinates.	CO 3
39	**Write about haar transform** The Haar transform can be used for image compression. The basic idea is to transfer the image into a matrix in which each element of the matrix represents a pixel in the image.	CO 3
40	**What is a nonlinear smoothing filter?** Order static filters are nonlinear smoothing spatial filters whose response is based on the ordering or ranking the pixels.	CO 3
MODULE III		
IMAGE RESTORATION AND FILTERING		
1	**Define Image enhancement** Image enhancement is the procedure of improving the quality and information content of original image	CO 4
2	**What are the primary and secondary colors** Three Primary Colours (Ps): Red, Yellow, Blue. Three Secondary Colours (S'): Orange, Green, and Violet.	CO 4
3	**What is spatial domain** The spatial domain is the normal image space, in which a change in position in I directly projects to a change in position in S.	CO 4

4	**Define point processing**	CO 4
	Point processing -where f (x, y) is the input image, g (x, y) is the processed image and T is point operator defined over some neighborhood of (x, y).	
5	**What are the two properties in Linear Operator?**	CO 4
	A function f is called a linear operator if it has the two properties: f(x+y)=f(x)+f(y) for all x and y; f(cx)=cf(x) for all x and all constants c.	
6	**How many numbers of steps are involved in image processing?**	CO 4
	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.	
7	**What is concept algebraic approach?**	CO 4
	The concept of algebraic approach is to estimate the original image which minimizes a predefined criterion of performances.	
8	**Define object recognition**	CO 4
	Recognition is the process that assigns a label 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	
9	**What is contrast stretching**	CO 4
	The transformation becomes a thresholding function that creates a binary image i.e ., In contrast stretching, if r1=r2, s1=0 and s2=L-1	
10	**What are the two methods of algebraic approach?**	CO 4
	1. Unconstraint restoration approach 2. Constraint restoration approach	
11	**What is transformation- linear function**	CO 4
	The locations of points (r1,s1) and (r2,s2)control the shape of the transformation function. If r1=s1 and r2=s2 then the transformation is a linear function that produces no changes in gray levels.	
12	**How transformation becomes a thresholding function**	CO 4
	The transformation becomes a thresholding function that creates a binary image i.e ., In contrast stretching, if r1=r2, s1=0 and s2=L-1	
13	**Define Gray-level interpolation**	CO 4
	Gray-level interpolation deals with the assignment of gray levels to pixels in the spatially transformed image	
14	**How to create a binary image**	CO 4
	If r1=r2, s1=0 and s2=L-1,the transformation becomes a thresholding function that creates a binary image.	
15	**What is meant by Noise probability density function**	CO 4

	The spatial noise descriptor is the statistical behavior of gray level values in the noise component of the model.	
16	**Define Gray-level slicing** Highlighting a specific range of graylevels in an image often is desired in gray-level slicing.	CO 4
17	**Define sharpening of an image?** Image sharpening refers to any enhancement technique that highlights edges and fine details in an image.	CO 4
18	**What is image translation and scaling?.** Image translation means reposition the image from one co-ordinate location to another along straight line path.	CO 4
19	**What is Image sharpening process** Image sharpening is an effect applied to digital images to give them a sharper appearance.	CO 4
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.	CO 4
21	**What is meant by unconstrained restoration?** The noise n a meaningful criterion function is to seek an f such that H f approximates of in a least square sense by assuming the noise term is as small as possible. It is also known as least square error approach.	CO 4
22	**Define Differentiation** As sharpening is the process perform differentiation on the pixels to Sharpen the image.	CO 4
23	**What is Image differentiation?** Image differentiation enhances the edges, discontinuities and deemphasizes the pixels with slow varying gray levels.	CO 4
24	**What are the three methods of estimating the degradation function?** 1. Observation 2. Experimentation 3. Mathematical modeling .	CO 4
25	**Define Enhancement and write examples** Enhancement technique is based primarily on the pleasing aspects it might present to the viewer. For example: Contrast Stretching.	CO 4
26	**Define Butterworth filter** The Butterworth filter is a type of signal processing filter designed to have a frequency response as flat as possible in the pass band.	CO 4
27	**State BPF** A band-pass filter or BPF is a device that passes frequencies within a certain range and rejects frequencies outside that range	CO 4
28	**Define LPF** A low-pass filter (LPF) attenuates content above a cutoff frequency, allowing lower frequencies to pass through the filter.	CO 4

29	**What is Function of HPF** A high-pass filter (HPF) attenuates content below a cutoff frequency, allowing higher frequencies to pass through the filter.	CO 4
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-rWhere s is output pixel r is input pixel	CO 4
31	**Define Intensity** The principle objective of Sharpening, to highlight transitions is called intensity/ The principle objective of Sharpening, to highlight transitions is Intensity.	CO 4
32	**Give the formula for negative and log transformation** Negative:$S = L - 1 - r; Log$:S = c log(1+r) Where c-constant and greater than are equal to zero	CO 4
33	**Define bit plane slicing?** Bit plane slicing is a method of representing an image with one or more bits of the byte used for each pixel	CO 4
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	CO 4
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.	CO 4
36	**List the two properties in Linear Operator?** Additivity and Homogeneity.	CO 4
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).	CO 4
38	**Define homogeneity 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.	CO 4
39	**Define circular 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 circular matrix.	CO 4
40	**What is concept algebraic approach?** The concept of algebraic approach is to estimate the original image which minimizes a predefined criterion of performances.	CO 4

MODULE IV		
COLOR IMAGE PROCESSING		
1	**What is the segmentation?** Segmentation procedures partition an image into its constituent parts or objects.	CO 5
2	**What is the role of segmentation in image processing?** Deals with partitioning an image into its constituent parts or objects	CO 5
3	**Define segmentation?** Segmentation is the process of portioning an image into it's constituted regions or objects based on certain criteria. Image segmentation algorithms are based on either discontinuity principle or Similarity principle.	CO 5
4	**What is object?.** Object in image processing is an identifiable portion of an image that can be interpreted as a single unit.	CO 5
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.	CO 5
6	**Write the applications of segmentation** 1. Detection of isolated points. 2. Detection of lines and edges in an image.	CO 5
7	**Define Nonzero response at onset of gray level line?** The derivations of digital functions are defined in terms of differences. The 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.	CO 5
8	**What are the three types of discontinuity in digital image?** Points, lines and edges	CO 5
9	**List the applications of image segmentation** Content-based image retrieval. Machine vision. Medical imaging, including volume rendered images from computed tomography and magnetic resonance imaging,Object detection, Recognition Tasks,Traffic control systems. Video surveillance.	CO 5
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.	CO 5
11	**Define noise point.**	CO 5
	Image noise is random variation of brightness or color information in images, and is usually an aspect of electronic noise. It can be produced by the image, Isolated point is also called as noise point.	

12	**Write about linking edge points.**	CO 5
	The approach for linking edge points isto 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.	
13	**Define Thicker**	CO 5
	The first order derivatives produce thicker edges and the second order derivatives produce much finer edges.	
14	**What are the two properties used for establishing similarity of edge pixels?**	CO 5
	1 .The strength of the response of the gradient operator used to produce the edge pixel. (2) The direction of the gradient.	
15	**What is mean by Edges and discontinuities?**	CO 5
	Image Differentiation enhances Edges and other discontinuities.	
16	**Define edge?**	CO 5
	Edges are significant local changes in the image and are important features for analyzing images.	
17	**Define Pixel Density**	CO 5
	Pixel density is a calculation that returns the number of physical pixels per inch on a screen or display of a device.	
18	**List the properties of the second derivative around an edge**	CO 5
	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	
19	**Define Gradient Operator**	CO 5
	The gradient of an image f(x,y) at location(x,y) is defined as the vector Magnitude of the vector	
20	**Define object point and background point?**	CO 5
	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	
21	**What is global threshold?**	CO 5
	When Threshold T depends only on f(x,y) then the threshold is called global.	
22	**Define region growing**	CO 5
	Region growing is a procedure that Groups pixels or sub regions in to layer regions based on predefined criteria.	
23	**Specify the steps involved in splitting and merging**	CO 5
	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.	
24	**What is Local threshold?**	CO 5

	If Threshold T depends both on f(x,y) and p(x,y) is called local Threshold.	
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	CO 5
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.	CO 5
27	**What is object recognization in image processing** Object recognition consists of recognizing, identifying, and locating objects within a picture with a given degree of confidence	CO 5
28	**List the factors affecting the accuracy of region growing?** The factors affecting the accuracy of region growing are like lightning variations, pixel's intensity value	CO 5
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 arbitrary ,disjoint regions and then the regions are merger and /or splitted to satisfy the basic conditions.	CO 5
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.	CO 5
31	**List out Image Segmentation Techniques** The various segmentation techniques based on (1) gray level discontinuity and (2) gray level similarity are well depicted in a graph	CO 5
32	**What is the cause of ringing effect?** If your sampling rate does not include all frequencies in your image, ringing effect occurs.	CO 5
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.	CO 5
34	**What problem occurs when the Image has low luminance?** When the histogram of the image is restricted to a small region of luminance Intensity and uniform thresholding does not give good results.	CO 5
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.	CO 5
36	**Define pixel neighborhood?**	CO 5

	In many applications, it is important to check the connectedness of a region, something that it is done using the neighborhood definition.	
37	**Define region connectedness?**	CO 5
	A region R is called connected if any two pixels (xA, yA), (xB, yB) belonging to R.	
38	**List out the factors why Segmentation is usually not perfect**	CO 5
	Noise, Bad illumination	
39	**What are the two approaches to segmentation?**	CO 5
	Region based segmentation & edge segmentation	
40	**Define closing**	CO 5
	Dilation followed by erosion is called closing.	
MODULE V		
MORPHOLOGICAL IMAGE PROCESSING		
1	**What is the expanded form ofJPEG?**	CO 6
	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.	
2	**State image compression?**	CO 6
	Image compression refers to the process of redundancy amount of data required to represent the given quantity of information for digital image.	
3	**What are two main types of Data compression?**	CO 6
	Lossless compression can recoverthe exact original data after compression. It is used mainly for compressing database records, spreadsheets or word processingFiles, where exact replication of the original is essential.	
4	**What is the need for compression?**	CO 6
	In terms of storage, the capacity of aStorage 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.	
5	**What is Data compression?**	CO 6
	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.	
6	**List out different Compression Methods?**	CO 6
	Run Length Encoding (RLE) Arithmetic coding Huffman coding and Transform coding	
7	**Define is coding redundancy**	CO 6
	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.	

8	**Define inter pixel redundancy**	CO 6
	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 inter pixel redundant. Eg: Run length coding	
9	**What is run length coding?**	CO 6
	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.	
10	**Define compression ratio.**	CO 6
	Compression Ratio = original size /compressed size	
11	**Define psychovisual redundancy**	CO 6
	In normal visual processing certain information has less importance than other information. So this information is said to be psycho visual redundant..	
12	**What is an encoder**	CO 6
	Source encoder is responsible for Removing the coding and interpixel redundancy and psycho visual redundancy. There are twocomponentsA) Source Encoder B) Channel Encoder	
13	**What is the function of source encoder**	CO 6
	Source encoder performs three operations 1) Mapper -this transformstheInput data into non-visual format. It reduces the interpixel redundancy.	
14	**What is channel encoder**	CO 6
	The channel encoder reduces the Impact of the channel noise by inserting redundant bits into the source encoded data.	
15	**List different types of decoders?**	CO 6
	ASource decoder- has two components a) Symbol decoder- b)Inverse mapping- c) Channel decoder	
16	**What operations are performed by error free compression?**	CO 6
	Devising an alternative representation of the image in which its inter pixel redundant are reduced. Coding the representation to eliminate coding redundancy	
17	**What is Variable Length Coding?**	CO 6
	Variable Length Coding is the simplestapproach to error free compression. It reduces only the coding redundancy. It assigns the shortest possible codeword to the most probable gray levels.	
18	**Define Huffman coding and mention its limitations**	CO 6
	Huffman coding is a popular technique for removing coding redundancy.	

19	**What is Block code** Each source symbol is mapped into fixed sequence of code symbols or code words. So it is called as block code	CO 6
20	**Define instantaneous code** A code word that is not a combination of any other codeword is said to be uniquely decodable code.	CO 6
21	**Define uniquely decodable code** A code word that is not a combination of any other codeword is said to be uniquely decodable code	CO 6
22	**State 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	CO 6
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.	CO 6
24	**Define arithmetic coding** In arithmetic coding one to one corresponds between source symbols and code word does't exists 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.	CO 6
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	CO 6
26	**How effectiveness of quantization can be improved?** 1. 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 bitstream	CO 6
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 compression, higher precision or Progressive reconstruction applications. 3. A lossless independent coding system for reversible compression.	CO 6
28	**Write the acronym for JPEG?** The acronym is expanded as "Jointhotographic Expert Group". It is an international standard in 1992.	CO 6

29	**What are the basic steps in JPEG?**	CO 6
	The Major Steps in JPEG Coding involve: 1. DCT 2. Quantization 3. Zigzag Scan 4. DPCM on DC component 5. RLE on AC Components 6. Entropy Coding	
30	**What is MPEG?**	CO 6
	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	
31	**Define I-frame**	CO 6
	I-frame is Intraframe or Independentframe. An I-frame is compressed independently of all frames. It resembles a JPEG encoded image.	
32	**State P-frame**	CO 6
	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	
33	**Define B-frame**	CO 6
	B-frame is the bidirectional frame. AB-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.	
34	**What is shift code?**	CO 6
	The two variable length codes are referred to as shift codes. A shift code is generated by i)Arranging probabilities of the source symbols are monotonically decreasing.	
35	**What are the types of redundancy?**	CO 6
	1. Coding Redundancy 2. Interpixel Redundancy 3. Psychovisual Redundancy	
36	**Define Psychovisual redundancy.**	CO 6
	Certain information which has lessrelative importance than other information in normal visual processing are said to be psychovisually redundant information	
37	**What is image compression?**	CO 6
	Image compression refers to the process of redundancy amount of data required to represent the given quantity of information for digital image.	
38	**What is Data Compression?**	CO 6
	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	
39	**List the two main types of Data compression?**	CO 6
	1. Lossless compression 2. Lossy compression	

40	**What is the need for Compression?**	CO 6
	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.	

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