# INSTITUTE OF AERONAUTICAL ENGINEERING

**(Autonomous)**

Dundigal, Hyderabad - 500 043

## COMPUTER SCIENCE AND ENGINEERING

### DEFINITIONS AND TERMINOLOGY QUESTION BANK

| | | |
|---|---|---|
| **Course Name** | : | **IMAGE PROCESSING** |
| **Course Code** | : | **ACS511** |
| **Program** | : | **B.Tech** |
| **Semester** | : | **V** |
| **Branch** | : | **COMPUTER SCIENCE AND ENGINEERING** |
| **Section** | : | **C & D** |
| **Academic Year** | : | **2019 - 2020** |
| **Course Faculty** | : | **Ms. S J Sowjanya, Assistant Professor**<br>**Ms. B Tejaswi, Assistant Professor** |

### COURSE OBJECTIVES:

| **The course should enable the students to:** | |
|---|---|
| I | Understand the concepts of digital image processing methods and techniques. |
| II | Study the image enhancement techniques in spatial and frequency domain for image quality improvement |
| III | Learn the image restoration and compression techniques for optimization. |
| IV | Explore on color image features and transformation techniques. |
| V | Illustrate the techniques of image segmentation to identify the objects in the image. |

### DEFINITIONS AND TERMINOLOGY QUESTION BANK

| S.No | QUESTION | ANSWER | Blooms Level | CO | CLO | CLO Code |
|---|---|---|---|---|---|---|
| **UNIT -I** | | | | | | |
| 1 | Define Image | An Image may be defined as a two dimensional function f (x,y) where x & y are spatial (plane) coordinates, and the amplitude of f at any pair of coordinates (x,y) is called intensity or gray level of the image at that point. When x,y and the amplitude values of f are all finite, discrete quantities we call the image as Digital Image. | Understand | CO 1 | CLO 1 | ACS511.01 |
| 2 | Define Image Sampling | Digitization of spatial coordinates (x,y) is called Image Sampling. To be suitable for computer processing, an image function f(x,y) must be digitized both spatially and in magnitude. | Remember | CO 1 | CLO 2 | ACS511.02 |
| 3 | Define Quantization | Digitizing the amplitude values is called Quantization. Quality of digital image is determined to a large degree by the number of | Remember | CO 1 | CLO 3 | ACS511.03 |

| S.No | QUESTION | ANSWER | Blooms Level | CO | CLO | CLO Code |
|---|---|---|---|---|---|---|
| | | samples and discrete gray levels used in sampling and quantization | | | | |
| 4 | 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 | CO 1 | CLO 4 | ACS511.04 |
| 5 | 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. | Remember | CO 1 | CLO 1 | ACS511.01 |
| 6 | Define Resolutions | Resolution is defined as the smallest number of discernible detail in an image. Spatial resolution is the smallest discernible detail in an image and gray level resolution refers to the smallest discernible change is gray level. | Remember | CO 1 | CLO 1 | ACS511.01 |
| 7 | What do you meant by shrinking of digital images? | Shrinking may be viewed as under sampling. To shrink an image by one half, we delete every row and column. To reduce possible aliasing effect, it is a good idea to blue an image slightly before shrinking it | Remember | CO 1 | CLO 2 | ACS511.02 |
| 8 | What Is Image Transform? | An image can be expanded in terms of a discrete set of basis arrays called basis images. Unitary matrices can generate these basis images. Alternatively, a given NXN image can be viewed as an N^2X1 vectors. An image transform provides a set of coordinates or basis vectors for vector space. | Remember | CO 1 | CLO 3 | ACS511.03 |
| 9 | What is scaling? | Scaling is used to alter the size of the object or image (i.e) a co-ordinate system is scaled by a factor. | Remember | CO 1 | CLO 4 | ACS511.04 |
| 10 | Define pixel | An Image is a collection of individual points referred as pixel, thus a Pixel is the element of a digital image. | Remember | CO 1 | CLO 2 | ACS511.02 |
| 11 | What do you meant by Gray level? | Gray level refers to a scalar measure of intensity that ranges from black to grays and finally to white | Remember | CO 1 | CLO 2 | ACS511.02 |
| 12 | 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 | CO 1 | CLO 3 | ACS511.03 |

| S.No | QUESTION | ANSWER | Blooms Level | CO | CLO | CLO Code |
|---|---|---|---|---|---|---|
| 13 | Define Digital image | When x, y and the amplitude values of f all are finite discrete quantities , we call the image digital image | Understand | CO 1 | CLO 3 | ACS511.03 |
| 14 | Define sampling | Sampling means digitizing the co-ordinate value (x, y). | Remember | CO 1 | CLO 4 | ACS511.04 |
| 15 | What is image translation and scaling? | Image translation means reposition the image from one co-ordinate location to another along straight line path. | Remember | CO 1 | CLO 4 | ACS511.04 |
| **UNIT -II** | | | | | | |
| 1 | What Is Image Enhancement? | Image enhancement is to process an image so that the output is more suitable for specific application. | Remember | CO 2 | CLO 5 | ACS511.05 |
| 2 | List the categories of image enhancement | The categories of Image Enhancement are<br>1. Spatial domain<br>2. Frequency domain | Remember | CO 2 | CLO 5 | ACS511.05 |
| 3 | Define Histogram | The histogram of a digital image with gray levels in the range [0, L-1] is a discrete function h (rk) = nk, where rk is the kth gray level and nk is the number of pixels in the image having gray level rk. | Understand | CO 2 | CLO 5 | ACS511.05 |
| 4 | Explain spatial filtering? | Spatial filtering is the process of moving the filter mask from point to point in an image. | Understand | CO 2 | CLO 5 | ACS511.05 |
| 5 | Define averaging filters? | The output of a smoothing, linear spatial filter is the average of the pixels contain in the neighborhood of the filter mask. These filters are called averaging filters. | Understand | CO 2 | CLO 5 | ACS511.05 |
| 6 | 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. | Remember | CO 2 | CLO 6 | ACS511.06 |
| 7 | What is maximum filter and minimum filter? | The 100th percentile is maximum filter is used in finding brightest points in an image. The 0th percentile filter is minimum filter used for finding darkest points in an image. | Remember | CO 2 | CLO 5 | ACS511.05 |
| 8 | Give an application of high pass filter | high pass filter is useful in extracting edges and sharpening images | Remember | CO 2 | CLO 6 | ACS511.06 |
| 9 | Give an application of band pass filter | band pass filter is useful in enhancement of edges and other high pass images | Remember | CO 2 | CLO 7 | ACS511.07 |
| 10 | Give an application of low pass filter | Low pass filter is useful for noise smoothing and interpolation | Remember | CO 2 | CLO 8 | ACS511.08 |
| 11 | Define Replication | Replication is a zero-order hold where each pixel along a scan | Remember | CO 2 | CLO 8 | ACS511.08 |

| S.No | QUESTION | ANSWER | Blooms Level | CO | CLO | CLO Code |
|---|---|---|---|---|---|---|
| | | line is repeated once and then each scan line is repeated | | | | |
| 12 | Define linear interpolation | It is a first order hold where a straight line is first fitted in between pixels along a row | Remember | CO 2 | CLO 8 | ACS511.08 |
| 13 | 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 | CO 2 | CLO 7 | ACS511.07 |
| 14 | 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 | CO 2 | CLO 7 | ACS511.07 |
| 15 | What is meant by masking? | Mask is the small 2-D array in which the values of mask co-efficient determines the nature of process. The enhancement technique based on this type of approach is referred to as mask processing The enhancement technique based on this type of approach is referred to as mask processing. The enhancement technique based on this type of approach is referred to as mask processing. | Remember | CO 2 | CLO 7 | ACS511.07 |
| **UNIT -III** | | | | | | |
| 1 | Define image restoration | It also deals with appealing of an image but it is objective(Restoration is based on mathematical or probabilistic model or image degradation). | Understand | CO 3 | CLO 9 | ACS511.09 |
| 2 | What is inverse filter | Inverse filtering is the process of recovering the input of a system from its output | Remember | CO 3 | CLO 9 | ACS511.09 |
| 3 | What is pseudoinverse filter? | The pseudoinverse filter is a stabilized version of inverse filter | Remember | CO 3 | CLO 9 | ACS511.09 |
| 4 | Give main limitation of inverse and pseudoinverse filter | The main limitation of inverse and pseudoinverse filter is that these filters remain very sensitive to noise | Remember | CO 3 | CLO 10 | ACS511.10 |
| 5 | What is wiener filter ? | Wiener filtering is a method of restoring images in the presence of blur as well as noise | Remember | CO 3 | CLO 10 | ACS511.10 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 6 | Define smoothing spline | Smoothing splines are curves used to estimate a continuous function from its sample values available on a grid | Understand | CO 3 | CLO 11 | ACS511.11 |
| 7 | Give an application of spline function | Spline functions are useful for magnification and noise smoothing | Remember | CO 3 | CLO 11 | ACS511.11 |
| 8 | Give a difference of image restoration and image enhancement | Image restoration is concerned with accentuation or extraction of image features rather than restoration of degradations | Understand | CO 3 | CLO 12 | ACS511.12 |
| 9 | What is meant by least mean square filter? | The main limitation of inverse and pseudoinverse filter is that these filters remain very sensitive to noise. wiener filtering is a method of restoring images in the presence of blur as well as noise | Remember | CO 3 | CLO 12 | ACS511.12 |
| 10 | What is meant by blind image restoration? | Degradation may be difficult to measure or may be time varying in an unpredictable manner. In such cases information about the degradation must be extracted from the observed image either explicitly or implicitly. This task is called image restoration | Remember | CO 3 | CLO 10 | ACS511.10 |
| 11 | What are approaches for blind image restoration? | 1.Direct measurement<br><br>2.Indirect estimation | Remember | CO 3 | CLO 10 | ACS511.10 |
| 12 | What is meant by indirect estimation? | indirect estimation method employs temporal or spatial averaging to either obtain a restoration or to obtain key elements of an image restoration algorithm | Remember | CO 3 | CLO 11 | ACS511.11 |
| 13 | What is blur impulse response? | This parameter is measured by isolating an image of a suspected object within a picture. | Remember | CO 3 | CLO 11 | ACS511.11 |
| 14 | What is noise level? | The noise of an observed image can be estimated by measuring the image covariance over a region of constant background luminance | Remember | CO 3 | CLO 12 | ACS511.12 |
| 15 | Define spatial transformation | Spatial transformation is defined as the rearrangement of pixels on an image plane. | Remember | CO 3 | CLO 12 | ACS511.12 |

| UNIT-IV | | | | | | |
|---|---|---|---|---|---|---|
| 1 | 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 | CO 4 | CLO 13 | ACS511.13 |
| 2 | List the hardware oriented color models. | The hardware oriented color models are as follows,<br>i.RGB model<br>ii.CMY model<br>iii.YIQ model<br>iv.HSI model | Remember | CO 4 | CLO 13 | ACS511.13 |
| 3 | What is Hue of saturation? | Hue is a color attribute that describes a pure color where saturation gives a measure of the degree to which a pure color is diluted by white light. | Remember | CO 4 | CLO 13 | ACS511.13 |
| 4 | List the applications of color models. | The applications of color models are,<br>i.RGB model--- used for color monitor & color video camera<br>ii.CMY model---used for color printing<br>iii.HIS model----used for color image processing<br>iv.YIQ model---used for color picture transmission | Remember | CO 4 | CLO 14 | ACS511.14 |
| 5 | Define Resolutions. | Resolution is defined as the smallest number of discernible detail in an image. Spatial resolution is the smallest discernible detail in an image and gray level resolution refers to the smallest discernible change is gray level. | Remember | CO 4 | CLO 13 | ACS511.13 |
| 6 | What is image compression? | Image compression refers to the process of redundancy amount of data required to<br>represent the given quantity of information for digital image. The basis of reduction<br>process is removal of redundant data | Remember | CO 4 | CLO 14 | ACS511.14 |
| 7 | 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 | CO 4 | CLO 15 | ACS511.15 |
| 8 | What are different Compression Methods? | Run Length Encoding (RLE) Arithmetic coding Huffman coding and Transform coding | Remember | CO 4 | CLO 16 | ACS511.16 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 9 | 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 | CO 4 | CLO 16 | ACS511.16 |
| 10 | Define inter pixel 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. | Remember | CO 4 | CLO 16 | ACS511.16 |
| 11 | Define compression ratio. | Compression Ratio = original size / compressed size: 1 | Remember | CO 4 | CLO 16 | ACS511.16 |
| 12 | What is the need for Compression? | If data can effectively be compressed wherever possible, significant improvements of data throughput can be achieved. Many files can be combined into one compressed document making sending easier. | Remember | CO 4 | CLO 15 | ACS511.15 |
| 13 | 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 | CO 4 | CLO 15 | ACS511.15 |
| 14 | 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 | CO 4 | CLO 15 | ACS511.15 |
| 15 | 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 | CO 4 | CLO 14 | ACS511.14 |
| **UNIT -V** | | | | | | |
| 1 | Define morphological processing | It deals with tools for extracting image components that are useful in the representation & description of shape. | Remember | CO 5 | CLO 17 | ACS511.17 |
| 2 | What is pattern recognition? | It involves the techniques for arranging pattern to their respective classes by automatically and with a little human intervention | Remember | CO 5 | CLO 17 | ACS511.17 |
| 3 | What are the three principle pattern arrangements? | The three principal pattern arrangements are vectors, Strings and trees. Pattern vectors are represented by old lowercase letters such as x ,y, z and it is represented in the form x=[x1, x2, ……xn]. Each | Remember | CO 5 | CLO 18 | ACS511.18 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | component x represents Ith descriptor and n is the number of such descriptor. | | | | |
| 4 | What is meant by object point and background point? | To execute the objects from the background is to select a threshold T that separate 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 | CO 5 | CLO 18 | ACS511.18 |
| 5 | What is pattern class? | It is a family of patterns that share some common properties. Pattern classes are denoted as w1,w2,w3,…… wM where M is the number of classes | Understand | CO 5 | CLO 19 | ACS511.19 |
| 6 | What is pattern? | Pattern is a quantitative or structural description of an object or some other entity of interest in an image. It is formed by one or more descriptors | Understand | CO 5 | CLO 19 | ACS511.19 |
| 7 | List the approaches to describe texture of a region. | The approaches to describe the texture of a region are i.Statistical ii.Structural iii.Spectural | Understand | CO 5 | CLO 20 | ACS511.20 |
| 8 | Define region growing. | Region growing is a procedure that groups pixels or sub regions into layer regions based on predefined criteria. The basic approach is to start with a set of seed points and from the grow regions by appending to each seed these neighboring pixels that have properties similar to the seed. | Understand | CO 5 | CLO 20 | ACS511.20 |
| 9 | What is edge? | An edge is a set of connected pixels that lie on the boundary between two regions. Edges are more closely modeled as having a ramp like profile. The slope of the ramp is inversely proportional to the degree of blurring in the edge. | Understand | CO 5 | CLO 17 | ACS511.17 |
| 10 | 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 | CO 5 | CLO 17 | ACS511.17 |
| 11 | How the derivatives are obtained in edge detection during formulation? | The first derivative at any point 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. | Remember | CO 5 | CLO 18 | ACS511.18 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 12 | Why edge detection is most common approach for detecting discontinuities? | The isolated points and thin lines are not frequent occurrences in most practical applications, so edge detection is mostly preferred in detection of discontinuities. | Remember | CO 5 | CLO 18 | ACS511.18 |
| 13 | What are the three types of discontinuity in digital image? | Three types of discontinuity in digital image are points, lines and edges | Remember | CO 5 | CLO 19 | ACS511.19 |
| 14 | Write the applications of segmentation? | Applications of segmentation are<br>i. Detection of isolated points.<br>ii. Detection of lines and edges | Remember | CO 5 | CLO 17 | ACS511.17 |
| 15 | What is segmentation? | The first step in image analysis is to segment the image. Segmentation subdivides an image into its constituent parts or objects | Remember | CO 5 | CLO 18 | ACS511.18 |

**Signature of the Faculty** **HOD, CSE**