UNIT II

1. 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.

2. Explain the 2 categories of image enhancement.
i) Spatial domain refers to image plane itself & approaches in this category are based on direct manipulation of picture image.
ii) Frequency domain methods based on modifying the image by fourier transform.

3. 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.

4. 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.

5. 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.

6. What is the purpose of image averaging?
An important application of image averagingis 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.

7. 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.

8. Give the formula for negative and log transformation.
Negative: S=L-1-r
Log: S = c log(1+r)

Where c-constant and r 0

9. 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.

10. 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-kth gray level nk-number of pixels in the image having gray level rk.

11. What is meant by histogram equalization?
k k
Sk= T(rk) = _ Pr(rj) = _ nj/n where k=0,1,2,….L-1
j=0 j=0
This transformation is called histogram equalization.

12. Differentiate linear spatial filter and non-linear spatial filter.
s.no. Linear spatial filter Non-linear spatial filter
1.
2.
Response is a sum of products of
the filter co-efficient.
R = w(-1,-1) f(x-1,y-1) +
w(-1,0) f(x-1,y) + … +
w(0,0) f(x,y) + … +
w(1,0) f(x+1,y) +
w(1,1) f(x+1,y+1).
They do not explicitly use coefficients
in the sum-of-products.
R = w1z1 + w2z2 + … +w9z9
9
= _ wizi
i=1

13. Give the mask used for high boost filtering.
-1 -1 -1
-1 A+8 -1
-1 -1 -1
0 -1 0

-1 A+4 -1
0 -1 0

14. What is meant by laplacian filter?
The laplacian for a function f(x,y) of 2 variables is defined as,
2 2 2 2 2
f = _ f / _ x + _ f / _ y

15. Write the steps involved in frequency domain filtering.
x+y

1. Multiply the input image by (-1) to center the transform.
2. Compute F(u,v), the DFT of the image from (1).
3. Multiply F(u,v) by a filter function H(u,v).
4. Compute the inverse DFT of the result in (3).
5. Obtain the real part of the result in (4).
x+y
6. Multiply the result in (5) by (-1)

16. Give the formula for transform function of a Butterworth low pass filter.
The transfer function of a Butterworth low pass filter of order n and with cut off frequency at a distance D0 from the origin is,
2n
H(u,v) = 1 / 1 + [D(u,v) / D0]
2 2 1/2
Where D(u,v) = [(u – M/2) + (v-N/2)]

17. What do you mean by Point processing?
Image enhancement at any Point in an image depends only on the gray level at that point is often referred to as Point processing.

18. 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

19. Define Derivative filter?
For a function f (x, y), the gradient f at co-ordinate (x, y) is defined as the vector
_f = _f/_x
_f/_y

_f = mag (_f) = {[(_f/_x) 2 +(_f/_y) 2]} ½

20. Explain spatial filtering?
Spatial filtering is the process of moving the filter mask from point to point in an image. For linear spatial filter, the response is given by a sum of products of the filter coefficients, and the corresponding image pixels in the area spanned by the filter mask.

21. 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.

22. 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.

23. Write the application of sharpening filters?
1. Electronic printing and medical imaging to industrial application
2. Autonomous target detection in smart weapons.

24. Name the different types of derivative filters?
1. Perwitt operators
2. Roberts cross gradient operators
3. Sobel operators

UNIT-II Image Enhancement

1. Explain the types of gray level transformation used for image enhancement.
   - : Negative Transformation
   - : Log Transformations
   - : Power – Law Transformations
   - : Piecewise – linear Transformation functions.

2. Explain Histogram processing.
   - : Histogram Equalization (or) Histogram Linearization
   - : Histogram matching (or) Histogram Specification
   - : Local Histogram Processing
   - : use of Histogram Statistic for image enhancement.

3. Discuss the image Smoothing filter.
   - : Smoothing By linear filters
   - : Smoothing by non-linear filters.

4 What are Image Sharpening filter?

: Image Enhancement using Second Derivatives

: Image Enhancement using first Derivative

: comparision b/w First and second-order Derivative

5. Explain Sharpening by frequency domain filters

: Ideal Highpass filter (IHPF)

: Butterworth Highpass filter (BHPF)

: Gaussian Highpass filter (GHPF)

: The Laplacian in the freq domain

: Enhancing the filter Images

6. Explain Homomorphic filter

: illumination – Reflection model

: Homomorphic filtering procedure

: Advantages