



HALDIA INSTITUTE OF TECHNOLOGY

(AN AUTONOMOUS INSTITUTION UNDER MAULANA ABUL KALAM AZAD
UNIVERSITY OF TECHNOLOGY, WEST BENGAL)

Paper Code: PEC-CS 601D

Paper Name: Image Processing

Time Allotted: 2 Hours

Full Marks: 70

*The figures in the margin indicate full marks
Candidates are required to give their answers in their own words as far as practicable*

Group – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives from the followings: 30 x 1 = 30

(i) Which of the following is the first and foremost step in Image Processing? [CO1]

- a) Image acquisition
- b) Segmentation
- c) Image enhancement
- d) Image restoration

(ii) _____ determines the quality of a digital image. [CO1]

- a) The discrete gray levels
- b) The number of samples
- c) discrete gray levels & number of samples
- d) None of the mentioned

(iii) Which of the following is the abbreviation of JPEG? [CO1]

- a) Joint Photographic Experts Group
- b) Joint Photographs Expansion Group
- c) Joint Photographic Expanded Group
- d) Joint Photographic Expansion Group:

(iv) Which of the following operation is done on the pixels in sharpening the image, in the spatial domain? [CO2]

- a) Differentiation
- b) Median
- c) Integration
- d) Average

(v) Which gives a measure of the degree to which a pure colour is diluted by white light?

- a) Saturation [CO1]
- b) Hue
- c) Brightness
- d) Intensity

(vi) Which is a colour attribute that describes a pure colour? [CO1]

- a) Saturation
- b) Hue
- c) Brightness
- d) Intensity

(vii) Which of the following occurs in Unsharp Masking? [CO2]

- a) Subtracting blurred image from original
- b) Blurring the original image
- c) Adding a mask to the original image
- d) All of the mentioned

(viii) Which of the following makes an image difficult to enhance? [CO4]

- a) Dynamic range of intensity levels
- b) High noise
- c) Narrow range of intensity levels
- d) All of the mentioned

(ix) The number of grey values are integer powers of: [CO1]

- a) 4
- b) 2
- c) 8
- d) 1

(x) To convert a continuous sensed data into Digital form, which of the following is required? [CO1]

- a) Sampling
- b) Quantization
- c) Both Sampling and Quantization
- d) Neither Sampling nor Quantization

(xi) For a continuous image $f(x, y)$, how could be Sampling defined? [CO1]

- a) Digitizing the coordinate values
- b) Digitizing the amplitude values
- c) All of the mentioned
- d) None of the mentioned

(xii) The process of using known data to estimate values at unknown locations is called [CO1]

- a) Acquisition
- b) Interpolation
- c) Pixelation
- d) None of the Mentioned

(xiii) In the Visible spectrum the _____ colour has the maximum wavelength. [CO1]

- a) Violet

- b) Blue
- c) Red
- d) Yellow

(xiv) Which of the following is the disadvantage of using smoothing filter? [CO3]

- a) Blur edges
- b) Blur inner pixels
- c) Remove sharp transitions
- d) Sharp edges

(xv) If $f(x,y)$ is an image function of two variables, then the first order derivative of a one dimensional function, $f(x)$ is: [CO3]

- a) $f(x+1)-f(x)$
- b) $f(x)-f(x+1)$
- c) $f(x-1)-f(x+1)$
- d) $f(x)+f(x-1)$

(xvi) What is the Second Derivative of Image Sharpening called? [CO3]

- a) Gaussian
- b) Laplacian
- c) Canny
- d) None of the mentioned

(xvii) The smallest discernible change in intensity level is called_____ [CO1]

- a) Intensity resolution
- b) Contour
- c) Contrast
- d) Saturation

(xviii) What is accepting or rejecting certain frequency components called as? [CO3]

- a) Filtering
- b) Eliminating
- c) Slicing
- d) None of the Mentioned

(xix) A filter that passes low frequencies is _____ [CO3]

- a) Band pass filter
- b) High pass filter
- c) Low pass filter
- d) None of the Mentioned

(xx) What is the process of moving a filter mask over the image and computing the sum of products at each location called as? [CO2]

- a) Convolution
- b) Correlation
- c) Linear spatial filtering
- d) Non linear spatial filtering

(xxi) What is the difference between Convolution and Correlation? [CO2]

- a) Image is pre-rotated by 180 degree for Correlation
- b) Image is pre-rotated by 180 degree for Convolution

- c) Image is pre-rotated by 90 degree for Correlation
- d) Image is pre-rotated by 90 degree for Convolution

(xxii) Convolution and Correlation are functions of _____ [CO2]

- a) Distance
- b) Time
- c) Intensity
- d) Displacement

(xxiii) Which of the following involves Correlation? [[CO2]

- a) Matching
- b) Key-points
- c) Blobs
- d) None of the Mentioned.

(xxiv) What is the basis for numerous spatial domain processing techniques? [CO2]

- a) Transformations
- b) Scaling
- c) Histogram
- d) None of the Mentioned

(xxv) What is Histogram Equalisation also called as? [CO2]

- a) Histogram Matching
- b) Image Enhancement
- c) Histogram linearisation
- d) None of the Mentioned

(xxvi) Averaging filters is also known as _____ filter. [CO2]

- a) Low pass
- b) High pass
- c) Band pass
- d) None of the Mentioned

(xxvii) Which of the following is best suited for salt-and-pepper noise elimination? [CO4]

- a) Average filter
- b) Box filter
- c) Max filter
- d) Median filter

(xxviii) What is/are the resultant image of a smoothing filter? [CO4]

- a) Image with high sharp transitions in gray levels
- b) Image with reduced sharp transitions in gray levels
- c) All of the mentioned
- d) None of the mentioned

(xxix) In Homomorphic filtering which of the following operations is used to convert input image to discrete Fourier transformed function? [CO3]

- a) Logarithmic operation
- b) Exponential operation
- c) Negative transformation
- d) None of the mentioned

- (xxx) Highlighting a specific range of intensities of an image is called _____ [CO1]
- a) Intensity Matching
 - b) Intensity Highlighting
 - c) Intensity Slicing
 - d) None of the Mentioned

Group – B
(Multiple Choice Type Questions)

2. Choose the correct alternatives from the followings:

10 x 2 = 20

(i) While performing the median filtering, suppose a 3*3 neighborhood has value (10, 20, 20, 20, 15, 20, 20, 25, 100), then what is the median value to be given to the pixel under filter?

[CO1]

- a) 15
- b) 20
- c) 100
- d) 25

(ii) When is the contrast stretching transformation a linear function, for r and s as gray-value of image before and after processing respectively? [CO2]

- a) $r_1 = s_1$ and $r_2 = s_2$
- b) $r_1 = r_2$, $s_1 = 0$ and $s_2 = L - 1$, L is the max gray value allowed
- c) $r_1 = 1$ and $r_2 = 0$
- d) None of the mentioned

(iii) In linear spatial filtering, what is the pixel of the image under mask corresponding to the mask coefficient w (1, -1), assuming a 3×3 mask ? [CO2]

- a) $f(x, -y)$
- b) $f(x+1, y)$
- c) $f(x, y-1)$
- d) $f(x+1, y-1)$

(iv) In bit-plane slicing if an image is represented by 8 bits and is composed of eight 1-bit plane, with plane 0 showing least significant bit and plane 7 showing most significant bit. Then, which plane(s) contain the majority of visually significant data. [CO2]

- a) Plane 4, 5, 6, 7
- b) Plane 0, 1, 2, 3
- c) Plane 0
- d) Plane 2, 3, 4, 5

(v) If the Gaussian filter is expressed as $H(u, v) = e^{-D^2(u,v)/2D_0^2}$, where $D(u, v)$ is the distance from point (u, v) , D_0 is the distance defining cutoff frequency, then for what value of $D(u, v)$ the filter is down to 0.607 of its maximum value? [CO1]

- a) $D(u, v) = D_0$
- b) $D(u, v) = D_0^2$
- c) $D(u, v) = D_0^3$
- d) $D(u, v) = 0$

(vi) The edges and other abrupt changes in gray-level of an image are associated with_____ [CO3]

- a) High frequency components
- b) Low frequency components
- c) Edges with high frequency and other abrupt changes in gray-level with low frequency components
- d) Edges with low frequency and other abrupt changes in gray-level with high frequency components

(vii) In 4-neighbours of a pixel p, how far are each of the neighbors located from p? [CO1]

- a) one pixel apart
- b) four pixels apart
- c) alternating pixels
- d) none of the Mentioned

(viii) Which of the following is NOT is not a type of Adjacency? [CO1]

- a) 4-Adjacency
- b) 8-Adjacency
- c) m-Adjacency
- d) None of the Mentioned

(ix) What is the technique for a gray-level transformation function called, if the transformation would be to produce an image of higher contrast than the original by darkening the levels below some gray-level m and brightening the levels above m in the original image. [CO1]

- a) Point processing
- b) Mask processing
- c) Contrast processing
- d) None

(x) Which of the following represent the correct equations for trichromatic coefficients? [CO1]

- a) $x=X/(X+Y+Z)$, $y=Y/(X+Y+Z)$, $z=Z/(X+Y+Z)$
- b) $x=(Y+Z)/(X+Y+Z)$, $y=(X+Z)/(X+Y+Z)$, $z=(X+Y)/(X+Y+Z)$
- c) $x=X/(X-Y+Z)$, $y=Y/(X-Y+Z)$, $z=Z/(X-Y+Z)$
- d) $x=(-X)/(X+Y+Z)$, $y=(-Y)/(X+Y+Z)$, $z=(-Z)/(X+Y+Z)$

Group – C

(Short Answer Type Questions)

3. Attempt any four from the followings:

4 x 5 = 20

- i) Explain the fundamental Steps of Digital Image Processing. [CO1]
- ii) Briefly explain Restoration by Homomorphic Filtering. [CO4]
- iii) Discuss the major application areas of GIS. [CO5]
- iv) Explain about Discrete Cosine Transform. [CO3]
- v) Consider the following image and Show the histogram after equalization. [CO2]

6	4	12	5
5	5	12	5
5	12	12	11
5	5	11	5

vi) Consider the image below and calculate the output of the pixel (2,2) if smoothing is done using 3 X 3 neighbourhood using mean, weighted average, median, min and max filter. [CO2]

1	8	8	0	7
4	7	9	5	7
5	4	6	8	6
4	2	0	1	5
0	1	0	2	0

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Signature of the Paper Setter/Moderator

Answer Key:

Group – A

1. (i) a	(ii) c	(iii) a	(iv) a	(v) a	(vi)b
(vii)d	(viii)d	(ix)b	(x)c	(xi)a	(xii)b
(xiii)c	(xiv)a	(xv)a	(xvi)b	(xvii)a	(xviii)a
(xix)c	(xx)b	(xxi)a	(xxii)d	(xxiii)a	(xxiv)c
(xxv)c	(xxvi)a	(xxvii)d	(xxviii)b	(xxix)a	(xxx)c

Group – B

2. (i)b	(ii)a	(iii) d	(iv) a	(v)a	(vi)a
(vii)a	(viii)d	(ix)c	(x) a		

Group – C

3. (i)	(ii)	(iii)	(iv)	(v)	(vi)
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