DIGITAL IMAGE PROCESSING

UNIT I

Fundamental steps of image processing, components of an image processing of system, the image model and image acquisition, sampling and quantization, station ship between pixels, distance functions, scanner.

UNIT II
Statistical and spatial operations, Grey level transformations, histogram equalization, smoothing & sharpening-spatial filters, frequency domain filters, homomorphic filtering, image filtering & restoration.
- Inverse and weiner filtering. FIR weiner filter.
- Filtering using image transforms, smoothing splines and interpolation.

UNIT III
Morphological and other area operations, basic morphological operations, opening and closing operations, dilation erosion, Hit or Miss transform, morphological algorithms, extension to grey scale images.
Segmentation and Edge detection region operations, basic edge detection, second order detection, crack edge detection, gradient operators, compass and laplace operators, edge linking and boundary detection, thresholding, region based segmentation, segmentation by morphological watersheds.

UNIT IV
Image compression: Types and requirements, statistical compression, spatial compression, contour coding, quantizing compression, image data compression-predictive technique, pixel coding, transfer coding theory, lossy and lossless predictive type coding.
Basics of color image processing, pseudocolor image processing, color transformation, color smoothing and sharpening, color segmentation, color image compression, compression standards.

UNIT V
Image Transforms - Fourier, DFT, DCT, DST, Haar, Hotelling, Karhunen -Loeve, Walsh, Hadamard, Slant. **Representation and Description -** Chain codes, Polygonal approximation, Signatures Boundary Segments, Skeltons, Boundary Descriptors, Regional Descriptors, Relational Descriptors, PCA.

TEXT BOOKS:
1. Digital Image Processing – by Rafael.C.Gonzalez & Richard E.Woods, 3rd edition, Pearson Education, 2008
2. Fundamentals of Digital Image Processing – by A.K. Jain, PHI

REFERENCES:
1. Digital Image Processing – William K, Part I - John Wiley edition.
2. Digital Image Processing using MATLAB – by Rafael.C.Gonzalez, Richard E.Woods, & Steven L.Eddins, Pearson Education, 2006
3. Digital Image Processing, Kenneth R. Castleman, Pearson Education, 2007

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Time: 3 hours   **Max.Marks:100**
Answer any FIVE questions
All questions carry equal marks

1.a)   Explain about sampling and quantization in image processing.
 b)   Explain various applications of digital Image processing. Discuss about the relationship between pixels.

[10+10
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2.a)   Explain the role of Grey level transformation.
 b)   Explain about Gaussian low pass and high pass filters in image enhancement.

[10+10]

3.a)   Explain about Homomorphic filtering approach in image enhancement.
 b)   Explain in detail about inverse filtering in image restoration.   [10+10]

4.a)   Explain about Bandpass and Notch filters in image restoration.
 b)   Explain the Edge linking and boundary detection technique in an image.   [10+10]

5.a)   Define opening and closing in mathematical morphology. Explain with the help of example.
 b)   Explain Watersheds. Write the algorithm for it. Give the applications of Watersheds.

[10+10
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6.a)   How binary morphology can be extend to gray scale morphology? Explain in detail with the help of examples.
 b)   Explain in detail DPCM predictive compression technique with an example.

[10+10]

7.a)   With mathematical expression discuss Haar transform and how it is useful in image Processing.
 b)   Explain about smoothing and sharpening of color image.   [10+10]

8.a)   Explain about boundary descriptors.
 b)   Explain about regional descriptors.
 c)   Explain about Relational descriptors
      [6+7+7]