Course Code: 16EC432

R16

SIDDHARTH GROUP OF INSTITUTIONS:: PUTTUR
(AUTONOMOUS)
Siddharth Nagar, Narayanavanam Road – 517583

QUESTION BANK (DESCRIPTIVE)

Subject with Code: Digital Image Processing (16ECE432)
Year & Sem: IV-B.Tech & I-Sem

Course & Branch: B.Tech - ECE
Regulation: R16

UNIT –I
INTRODUCTION TO DIGITAL IMAGE PROCESSING

1	a) List out the fundamental steps in digital image processing which can be applied to images.	[L1][CO1]	**[6M]**
	b) Define image processing and represent the digital images along with suitable example.	[L1][CO1]	**[6M]**
2	a) Explain the components of digital image processing along with the suitable block diagram.	[L2][CO1]	**[6M]**
	b) Define distance measures in digital image processing? Explain different types of distance measures.	[L2][CO1]	**[6M]**
3	a) List out the applications of digital image processing.	[L1][CO1]	**[6M]**
	b) Illustrate one of the applications of DIP with suitable diagrams.	[L2][CO1]	**[6M]**
4	a) Define the following terms: $N_4(p), N_D(p)$ &$N_8(p)$	[L1][CO1]	**[6M]**
	b) Discuss the following terms with example: Adjacency, 4-adjacency, 8-adjacency	[L2][CO1]	**[6M]**
5	Explain about image sampling and quantization process with proper steps.	[L2][CO1]	**[12M]**
6	Discuss the process of image sense and acquisition along with suitable diagrams.	[L2][CO1]	**[12M]**
7	Illustrate the following mathematical operations on digital images with relevant expressions and diagrams. a) Arithmetic operations b) Logical operations.	[L2][CO1]	**[12M]**
8	Explain the following mathematical operations on digital images. a) Array versus Matrix operations b) Linear versus Nonlinear Operations.	[L2][CO1]	**[12M]**
9	a) Explain the important terms related to Imaging Geometry with suitable applications.	[L2][CO1]	**[6M]**

	b) Determine the array product and matrix product for the following two images and summarize the result. $A = \begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix} \& B = \begin{bmatrix} 2 & -2 \\ -2 & 2 \end{bmatrix}$	[L5][CO1]	**[6M]**
10	a) Apply the set operation and logical operations in digital image processing along with suitable example.	[L3][CO1]	**[6M]**
	b) Evaluate the image addition, image subtraction and image multiplication operation for the following image and summarize the result. $f(x,y) = \begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix} \& g(x,y) = \begin{bmatrix} 2 & -2 \\ -2 & 2 \end{bmatrix}$	[L5][CO1]	**[6M]**

UNIT –II
IMAGE TRANSFORMS

1	a). Define Image Transform and Summarize its importance.	[L1][CO2]	**[5M]**
	b). List out the properties of 2D – Orthogonal Transform and 2D – Unitary transform.	[L1][CO2]	**[7M]**
2	a) Define 2D – Discrete Fourier Transform.	[L1][CO2]	**[2M]**
	b). List out the properties of 2D – Discrete Fourier Transform. Explain any one property with suitable equation.	[L2][CO2]	**[10M]**
3	a) Prove the Separable property of 2D – Discrete Fourier Transform with relevant expression.	[L5][CO2]	**[6M]**
	b) Prove the Periodicity property of 2D – Discrete Fourier Transform with relevant expression.	[L5][CO2]	**[6M]**
4	a) Determine the basis function of 2D – Discrete Fourier Transform when N = 4.	[L5][CO2]	**[6M]**
	b) Apply 2D – Discrete Fourier Transform for the following image. $f(x,y) = \begin{bmatrix} 0 & 1 & 2 & 1 \\ 1 & 2 & 3 & 2 \\ 2 & 3 & 4 & 3 \\ 1 & 2 & 3 & 2 \end{bmatrix}$	[L3][CO2]	**[6M]**
5	a) Determine the image basis function of 2D – Discrete Fourier Transform when N = 4.	[L5][CO2]	**[6M]**
	b) Apply 2D – Discrete Fourier Transform for the following image. $f(m,n) = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \end{bmatrix}$	[L3][CO2]	**[6M]**

6	a) Define 2D – Discrete Cosine Transform and discuss the properties of 2D-DCT.	[L1][CO2]	**[6M]**
	b) Determine the image basis function of 2D – Discrete Cosine Transform when N = 4.	[L5][CO2]	**[6M]**
7	a) Determine the image basis function of 2D – Discrete Cosine Transform when N = 4.	[L2][CO2]	**[6M]**
	b) Apply 2D – Discrete Cosine Transform for the following image. $f(m,n) = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \end{bmatrix}$	[L3][CO2]	**[6M]**
8	a) Determine the image basis function of Walsh Transform when N = 4.	[L5][CO2]	**[6M]**
	b) Summarize the conditions for Perfect Transform?	[L2][CO2]	**[6M]**
9	a) Determine the image basis function of Hadamard Transform when N = 4.	[L5][CO2]	**[6M]**
	b) Outline that KL transform is an Optimal Transform.	[L2][CO2]	**[6M]**
10	a) Outline the steps to be followed to calculate KL transform.	[L2][CO2]	**[6M]**
	b) Apply the KL transform for the following image. $f(m,n) = \begin{bmatrix} 1 & 2 \\ 2 & -1 \end{bmatrix}$	[L3][CO2]	**[6M]**

UNIT – III
IMAGE ENHANCEMENT

1	a). Define image enhancement and discuss the point operations in image enhancement?	[L1][CO3]	**[5M]**
	b). Illustrate the contrast stretching in image enhancement with suitable example.	[L2][CO3]	**[7M]**
2	a) Define negative image transformation and illustrate with suitable example.	[L1][CO3]	**[5M]**
	b). Summarize the Intensity level slicing operation and bit extraction operation in image enhancement with suitable example.	[L2][CO3]	**[7M]**
3	a) Define histogram and discuss the histogram four basic image types.	[L1][CO3]	**[6M]**
	b) Illustrate the procedure for histogram process and list out the uses of histogram.	[L2][CO3]	**[6M]**
4	a) Explain the mechanics of spatial filtering with suitable diagram.	[L2][CO3]	**[6M]**
	b) Illustrate the smoothing spatial filters along with the required expressions.	[L2][CO3]	**[6M]**
5	a) Illustrate the sharpening spatial filters along with the required expressions.	[L2][CO3]	**[6M]**

	b) Define the expression for first-order and second order derivative of a one-dimensional function f(x) and outline its significance.	[L1][CO3]	**[6M]**
6	a) Define the image enhancement in frequency domain and give the expression	[L1][CO3]	**[4M]**
	b) Illustrate the smoothing filters in frequency domain along with the required expressions.	[L2][CO3]	**[8M]**
7	a) Compare the Low Pass Filter and High Pass Filter in image processing methods.	[L2][CO3]	**[6M]**
	b) Illustrate the sharpening filters in frequency domain along with the required expressions.	[L2][CO3]	**[6M]**
8	a) Define the expressions for LPF and HPF and Label the ideal characteristics.	[L1][CO3]	**[4M]**
	b) Explain about Homomorphic filtering with necessary equations.	[L2][CO3]	**[8M]**
9	a) Define the following terms: Saturation, Hue and Brightness.	[L1][CO3]	**[6M]**
	b) Label the CIE chromaticity diagram and discuss its significance.	[L1][CO3]	**[6M]**
10	a) Define the following terms: Radiance, Luminance and Brightness.	[L1][CO3]	**[6M]**
	b) Outline the importance of the Color Models and explain the RGB models.	[L2][CO3]	**[6M]**

UNIT – IV
IMAGE DEGRADATION/RESTORATION

1	a) Identify parts of the degradation/restoration model in image processing and explain the function the each parts.	[L3][CO4]	**[5M]**
	b) List out the source of the noise in image processing and outline the spectrum of white noise.	[L1][CO4]	**[7M]**
2	a) Outline the different type of noise models and explain the Gaussian noise with proper PDF expression.	[L2][CO4]	**[6M]**
	b) Compare the Rayleigh noise and Erlang noise with proper PDF expression.	[L4][CO4]	**[6M]**
3	a) Summarize the importance of exponential noise, uniform noise and impulse noise along with PDF expression.	[L1][CO4]	**[6M]**
	b) Distinguish the Image Enhancement and Image Restoration.	[L4][CO4]	**[6M]**
4	a) Explain the inverse filtering for image restoration with relevant equations.	[L2][CO4]	**[6M]**
	b) Discuss the merits and demerits of inverse filtering.	[L5][CO4]	**[6M]**

5	a) Illustrate the Least Mean Square filters method for image restoration with suitable examples.	[L2][CO4]	**[8M]**
	b) Summarize the significance of the Arithmetic mean filter for image restoration.	[L1][CO4]	**[4M]**
6	a) Outline the importance of Geometric mean filter and Harmonic mean filter for image restoration.	[L1][CO4]	**[8M]**
	b) Summarize the role of the Impulse noise in image restoration.	[L1][CO4]	**[4M]**
7	a) Illustrate the Constrained Least square restoration method for image restoration with suitable examples.	[L2][CO4]	**[8M]**
	b) Summarize the significance of the Contra harmonic mean filter for image restoration.	[L3][CO4]	**[6M]**
8	a) Define Image Segmentation and list out the applications of image segmentation.	[L1][CO4]	**[4M]**
	b) Elaborate the **s**everal edge models for edge detection in image segmentation.	[L5][CO4]	**[8M]**
9	a) Explain the threshold based segmentation methods with suitable examples.	[L2][CO4]	**[8M]**
	b) Label the parts of Template matching and mention its function.	[L2][CO4]	**[4M]**
10	a) Demonstrate Region based Approaches for image segmentation along with examples.	[L2][CO4]	**[6M]**
	b) Outline the use of motion in segmentation	[L1][CO4]	**[6M]**

UNIT – V
IMAGE COMPRESSION

1	a) Define Image Compression and outline the importance of the image compression to the industry.	[L1][CO5]	**[5M]**
	b) Outline the function of the Image Compression Models with suitable block diagram.	[L1][CO5]	**[7M]**
2	a) Define Data, Information & Redundancy.	[L1][CO5]	**[6M]**
	b) Explain the coding redundancy and spatial/Temporal redundancy with suitable examples.	[L2][CO5]	**[6M]**
3	a) Define Huffman coding.	[L1][CO5]	**[2M]**
	b) Illustrate the procedure of the Huffman coding along with suitable example.	[L2][CO5]	**[10M]**
4	a) Evaluate the coding efficiency for the following probabilities based on Huffman coding.	[L5][CO5]	**[7M]**

Course Code: 16EC432 **R16**

	b) Illustrate the procedure of the Arithmetic coding along with suitable example.	[L2][CO5]	**[5M]**
5	a) Demonstrate the procedure of the bit plane coding along with suitable example.	[L2][CO5]	**[4M]**
	b) Evaluate the coding efficiency for the following probabilities based on Huffman coding.	[L5][CO5]	**[8M]**
6	a) Illustrate the procedure of the variable length coding along with suitable example.	[L2][CO5]	**[6M]**
	b) Compare the variable length coding and arithmetic coding.	[L4][CO5]	**[6M]**
7	a) Outline the function of Transform coding in image compression and explain the each parts of the transform coding.	[L2][CO5]	**[6M]**
	b) Classify image compression standards.	[L4][CO5]	**[6M]**
8	a) Compare the lossless compression and lossy compression.	[L2][CO5]	**[6M]**
	b) Summarize the role of JPEG and PNG for image compression.	[L2][CO5]	**[6M]**
9	a) Outline the importance of DICOM and TIFF for image compression.	[L2][CO5]	**[6M]**
	b) Demonstrate the steps for Measuring Image Information in image compression techniques.	[L2][CO5]	**[6M]**
10	a) Summarize the role of MPEG and SVG for image compression.	[L2][CO5]	**[4M]**
	b) Evaluate the coding efficiency for the following probabilities based on Huffman coding.	[L5][CO5]	**[8M]**

Symbol	$a1$	$a2$	$a3$	$a4$	$a5$	$a6$
Probability	0.4	0.3	0.1	0.1	0.06	0.04

Symbol	$m1$	$m2$	$m3$	$m4$	$m5$	$m6$
Probability	0.5	0.2	0.1	0.1	0.06	0.04

Symbol	$m1$	$m2$	$m3$	$m4$	$m5$	$m6$
Probability	0.1	0.2	0.1	0.1	0.25	0.25

PREPARED BY

1.Dr. P. G. KUPPUSAMY
Professor/ECE

2. Dr. K. ELANGOVAN
Professor/ECE