Course Code: 18EC0434 **R18**

SIDDARTHA INSTITUTE OF SCIENCE AND TECHNOLOGY:: PUTTUR
(AUTONOMOUS)
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QUESTION BANK (DESCRIPTIVE)

Subject with Code: DIGITAL IMAGE PROCESSING (18EC0434) **Course & Branch**: B.Tech - ECE
Regulation: R18 **Year & Sem:** IV-B.Tech & I-Sem

UNIT - I

INTRODUCTION TO DIGITAL IMAGE PROCESSING,IMAGE SENSING & ACQUISITION

1	a	Recall the terms pixel and image.	[L1][CO1]	[2M]
	b	Define resolution.	[L1][CO1]	[2M]
	c	What are the levels of image processing?	[L1][CO1]	[2M]
	d	List out the various types of adjacency.	[L1][CO1]	[2M]
	e	Recall the neighbors of a pixel using suitable representation.	[L1][CO1]	[2M]
2	**a**	What is the need for image processing? List out the fundamental steps in digital image processing which can be applied to images.	[L1][CO1]	[5M]
	b	Explain the various types of digital image representations with examples.	[L2][CO1]	[5M]
3	**a**	Summarize the concepts of image modeling with relevant expressions.	[L2][CO1]	[5M]
	b	Determine the array product and matrix product of the two images $A = \begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix}$ & $B = \begin{bmatrix} 2 & -2 \\ -2 & 2 \end{bmatrix}$	[L3][CO1]	[5M]
4	**a**	List out the various applications of digital image processing.	[L1][CO1]	[5M]
	b	Discuss about any one of the real time applications of DIP with suitable diagram.	[L2][CO1]	[5M]
5		Explain about the basic pixel relationships and distance measures between pixels in a digital image.	[L2][CO1]	[10M]
6		Explain about image sampling and quantization process with proper steps.	[L2][CO1]	[10M]
7		Discuss about the spatial operations and Geometric spatial transforms related to image processing.	[L2][CO1]	[10M]
8		Summarize the following mathematical operations on digital images with relevant expressions and diagrams. a)Arithmetic operations b) Linear versus Nonlinear Operations	 [L2][CO1] [L2][CO1]	 [5M] [5M]
9		Explain the following mathematical operations on digital images. a) Array & Matrix operations b) Set & Logical operations	 [L2][CO1] [L2][CO1]	 [5M] [5M]
10		Explain the important terms related to Imaging Geometry with suitable expressions.	[L2][CO1]	[10M]

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UNIT - II

IMAGE TRANSFORMS

1	a	List the important properties unitary image transforms.	[L1][CO2]	[2M]
	b	What do you mean by fast transforms?	[L1][CO2]	[2M]
	c	What is the goal of an image transform?	[L1][CO2]	[2M]
	d	What are advantages of Walsh transform over Fourier transform?	[L1][CO2]	[2M]
	e	What is the main difference between DCT and DFT ?	[L1][CO2]	[2M]
2	**a**	What is the need of image transform? List out various types of transform used in image processing?	[L1][CO2]	[5M]
	b	Discuss the importance of 2D Orthogonal and Unitary transforms.	[L2][CO2]	[5M]
3	**a**	Compare the computational complexity and number of operations of all the image transforms.	[L2][CO2]	[5M]
	b	List out the properties of 2D – Discrete Fourier Transform. Explain any one property with suitable expressions.	[L2][CO2]	[5M]
4	**a**	Illustrate that DFT matrix satisfies the unitary property with necessary expressions.	[L2][CO2]	[5M]
	b	Show that Discrete Fourier Transform has property of periodicity.	[L2][CO2]	[5M]
5	**a**	Explain about 2D – Discrete Fourier Transform.	[L2][CO2]	[5M]
	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]	[5M]
6		Prove the following two properties of 2D-DFT: i) Convolution ii) Correlation	[L3][CO2]	[10M]
7	**a**	Discuss about 2D – Discrete Cosine Transform with relevant mathematical functions.	[L2][CO2]	[4M]
	b	Predict the 2D – Discrete Cosine Transform matrix for N =4.	[L3][CO2]	[6M]
8	**a**	Identify the image basis function of 1 D Walsh Transform when N = 4.	[L3] [CO2]	[5M]
	b	Summarize the properties of Walsh Transform.	[L2] [CO2]	[5M]
9	**a**	Determine the Hadamard matrix for N =8 using recursive calculation from N=2.	[L3] [CO2]	[6M]
	b	Summarize the properties of Hadamard Transform.	[L2] [CO2]	[4M]
10		Explain in brief about Hoteling Transform	[L2] [CO2]	[10M]

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UNIT – III

IMAGE ENHANCEMENT & COLOR IMAGE PROCESSING

1	a	Recall the term Histogram equalization.	[L1][CO3]	[2M]
	b	What do you mean by image enhancement?	[L1][CO3]	[2M]
	c	Define point processing.	[L1][CO3]	[2M]
	d	Compare Pseudo color image processing and full color image processing.	[L1][CO3]	[2M]
	e	What are the applications of color image processing?	[L1][CO3]	[2M]
2	a	Discuss about basics of intensity transformation in image enhancement.	[L2][CO3]	[5M]
	b	Illustrate contrast stretching and bit plane slicing with suitable examples.	[L2][CO3]	[5M]
3	a	Illustrate the image negative transformation with suitable example.	[L2][CO3]	[5M]
	b	Explain the concept of histogram for various images with relevant diagrams.	[L2][CO3]	[5M]
4	a	Explain the histogram equalization operation in image enhancement with necessary expressions.	[L2][CO3]	[5M]
	b	Explain the procedure for histogram matching process.	[L2][CO3]	[5M]
5	a	Explain the mechanism of spatial domain filtering with suitable functions.	[L2][CO3]	[5M]
	b	Discuss about the linear and non-linear spatial filters with necessary expressions.	[L2][CO3]	[5M]
6	a	Illustrate the sharpening of images in spatial domain with Gradient and Laplacian operations with required expressions.	[L2][CO3]	[5M]
	b	Determine the median value of the marked pixels of the given matrix using 3 x 3 mask. $F=\begin{bmatrix}18 & 22 & 33 & 25 & 32 & 24\\ 34 & 128 & 24 & 172 & 26 & 23\\ 22 & 19 & 32 & 31 & 28 & 26\end{bmatrix}$	[L3][CO3]	[5M]
7	a	Summarize the concept of frequency domain filtering with necessary steps.	[L2][CO3]	[5M]
	b	Discuss about the types of smoothing filters in frequency domain with the required expressions.	[L2][CO3]	[5M]
8	a	Explain the concept of Laplacian in frequency domain filtering of images.	[L2][CO3]	[5M]
	b	Discuss about any two types of sharpening filters in frequency domain along with the required expressions.	[L2][CO3]	[5M]
9	a	Define the terms: Luminance and Chrominance.	[L1][CO3]	[4M]
	b	Explain about the RGB and CMYK color models.	[L2][CO3]	[6M]
10	a	Define the following terms: Saturation and Hue	[L1][CO3]	[4M]
	b	Discuss about CIE chromaticity diagram and mention its significance.	[L2][CO3]	[6M]

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UNIT – IV
IMAGE DEGRADATION/RESTORATION & IMAGE SEGMENTATION

1	a	What do you mean by image enhancement and image restoration?	[L1][CO4]	[2M]
	b	What are the advantages of a Wiener filter over an inverse filter?	[L1][CO4]	[2M]
	c	List the disadvantage of inverse filtering.	[L1][CO4]	[2M]
	d	List the significant features of a median filter.	[L1][CO4]	[2M]
	e	What is meant by image segmentation? Write its use in image processing.	[L1][CO4]	[2M]
2	**a**	Explain about degradation model with the help of block diagram.	[L2][CO4]	[5M]
	b	Discuss about the structure and mathematical functions for probability density functions of any 5 noise models.	[L2][CO4]	[5M]
3		Discuss the algebraic approach of constrained Least Square filter restoration.	[L2][CO4]	[10M]
4		Explain in detail about the Wiener filter approach.	[L2][CO4]	[10M]
5	**a**	Explain the fundamental steps performed in edge detection of images.	[L2][CO4]	[5M]
	b	Summarize the concept of image gradient and its properties in edge detection.	[L2][CO4]	[5M]
6	**a**	Illustrate the operation of Prewitt mask & Sobel mask operators in edge detection.	[L2][CO4]	[6M]
	b	List the fundamental approaches of edge linking and define the same.	[L1][CO4]	[4M]
7		Explain about the local processing approach of linking edge points with necessary steps.	[L5][CO4]	[10M]
8	**a**	Explain the role of thresholding in segmentation.	[L2][CO4]	[5M]
	b	Summarize the steps in Otsu's algorithm for global thresholding.	[L2][CO4]	[5M]
9		Explain the following with respect to motion in segmentation. a) Spatial Techniques b) frequency domain techniques	[L2][CO4]	[10M]
10		Explain the procedure for image segmentation based on (a)Region growing (b) region splitting & merging	[L2][CO4]	[10M]

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UNIT – V
WAVELETS & MULTIRESOLUTION PROCESSING & IMAGE COMPRESSION

1	a	What is the need for Compression?	[L1][CO5]	[2M]
	b	Define compression ratio.	[L1][CO5]	[2M]
	c	List out the various image compression standards.	[L1][CO5]	[2M]
	d	What do you meant by wavelet packet?	[L1][CO5]	[2M]
	e	List the significant advantages of image wavelet transforms.	[L1][CO5]	[2M]
2	**a**	Explain about image pyramids in multi-resolution processing.	[L2][CO5]	[5M]
	b	Summarize the concept of sub band coding with respect to image processing.	[L2][CO5]	[5M]
3		Explain the following with respect to multi resolution expansions. a)Scaling functions b) wavelet functions	[L2][CO5]	[10M]
4		Explain the following with respect to Wavelet Transform (WT). a) 1 D – Wavelet Transforms b) 2D Wavelet Transforms	[L2][CO5]	[10M]
5		Explain a) Fast Wavelet Transforms b) Wavelet packets	[L2][CO5]	[10M]
6	**a**	What is redundancy in image compression? Discuss the importance of data redundancies.	[L2[CO6]	[5M]
	b	Explain the various data redundancies with respect to image compression.	[L2][CO6]	[5M]
7		Classify the compression standards for images & videos and explain the same.	[L2][CO6]	[10M]
8		Explain the following with respect to image compression a) Run Length Coding b) Bit Plane coding	[L2][CO6]	[10M]
9		Explain about a) Transform based coding b) Arithmetic and Huffman coding	[L2][CO6]	[10M]
10		Predict the Code word, Average Length (L), Entropy (H(s)), Efficiency of the word **"COMMITTEE"** using binary Huffman coding.	[L5][CO6]	[10M]

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