INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

ASSIGNMENT QUESTIONS

Course Title	**DIGITAL IMAGE PROCESSING**
Course Code	**A70436-R15**
Class	**IV – B. Tech I Semester**
Branch	**ECE**
Year	**2018-2019**
Course Coordinator	**Dr. S China Venkateswarlu, Professor, ECE**
Team of Instructors	**Dr. V Padmanabha Reddy, Professor, ECE**

COURSE OBJECTIVE

This course gives the students the fundamentals of digital image processing, linear filtering, linear transforms, image enhancement in both spatial and frequency domain;; image reconstruction; inverse problems in imaging; edge detection; feature extraction; compression; wavelet based imaging and mathematical morphology

UNIT – I **DIGITAL IMAGE FUNDAMENTALS & IMAGE TRANSFORMS**			
S. No	**Question**	**Blooms Taxonomy Level**	**Course Outcomes**
1	Explain the steps involved in digital image processing	Understand	1
2	Discuss about the following relationships between pixels with neat diagrams Neighbors of a pixel Connectivity Distance measures Path.	Remember	1
3	Write the expressions for Walsh transform kernel and Walsh transform (1D &2D).	Remember	1
4	Briefly explain the forward and inverse transformation kernels of image transforms	Understand	1
5	Name and explain some important properties of 2-D DFT	Understand	1
6	Discuss about the Slant transform (1-D & 2-D)	Remember	1
7	Discuss about the Hadamard transforms (1-D & 2-D)	Remember	1
8	Discuss about the Haar transform (1-D & 2-D)	Remember	1
9	Discuss about the Hotelling transforms (1-D & 2-D)	Remember	1
10	State and prove separability property of 2D-DFT.	Understand	1
11	State and prove the translation property	Remember	1
12	State distributivity and scaling property	Remember	1
UNIT – II **IMAGE ENHANCEMENT (SPATIAL DOMAIN & FREQUENCY DOMAIN)**			
S. No	**Question**	**Blooms Taxonomy level**	**Course Outcomes**
1	Explain smoothing spatial filters and nonlinear order statistic spatial filters	Understand	2
2	Discuss in detail about Prewitt and Sobel edge Detectors.	Understand	2
3	Describe image Histogram Equalization.	Remember	2
4	Explain the method of using the second derivate for Image sharpening by Laplacian Operator.	Understand	2
5	What is high boost spatial filtering? Compare it with high pass spatial filtering.	Understand	2
6	Discuss how the Bit Plane Slicing is useful in image processing.	Remember	3
7	Discuss the importance of a kernel or mask or window in spatial filtering used for enhancement of a digital image.	Understand	3

8	How does the spatial filter with name Order static filter (non-linear filter) or median filter work?	Understand	3
9	What is meant by image enhancement by point processing? Discuss any two methods in it.	Remember	3
10	Define histogram of a digital image. Explain how histogram is useful in image enhancement?	Understand	3
11	Determined the about Smoothing Spatial filters	Understand	3
12	What is meant by the Gradiant and the Laplacian? Discuss their role in image enhancement.	Remember	3
13	Description of Homomorphic filtering	Understand	3
14	Expression for 2-D IHPF, Expression for BHPF, Expression for GHPF with sketches . Explain their usefulness in Image enhancement.	Understand	3
15	Give the expression for 2-D ILPF, BLPF & GLPF functions and sketch them. Explain their usefulness in Image enhancement.	Remember	3
16	Discuss in detail about Expression for Butterworth Low Pass Filter in frequency domain	Understand	3
17	Compare the characteristics of Low pass, High pass and Homomorphic filters in image enhancement in frequency domain.	Understand	3
18	Determined the Ideal High Pass Filter and Butterworth High Pass filter	Remember	3
19	Discuss about Gaussian High Pass and Gaussian Low Pass Filter	Understand	3
20	Explain how Laplacian is implemented in frequency domain	Understand	3
21	Write about high boost and high frequency filtering	Remember	3
UNIT – III IMAGE RESTORATION			
S. No	**Question**	**Blooms Taxonomy level**	**Course Outcomes**
1	Obtain the method of Least Mean Squares Filtering (Wiener) for image restoration	Understand	4
2	Explain model of image degradation/restoration process with a block diagram	Remember	4
3	Determined the method of Constrained Least Squares Filtering for image restoration	Understand	4
4	Explain three principle ways to estimate the degradation function for use in image restoration	Understand	4
5	Discuss the process of image restoration by direct inverse filtering?	Understand	4
MID-II			
6	Write about Noise Probability Density Functions for all noise models	Understand	4
7	Explain about iterative nonlinear restoration using the Lucy–Richardson algorithm.	Understand	4
8	Explain Iterative deterministic approaches to restoration Constrained least squares iteration and Least squares iteration	Understand	4
9	Explain notch reject filters. How can we obtain the notch filter that pass rather than suppressing the frequency in notch area?	Remember	4
10	Derive the expression for observed image when the degradations are linear position invariant.	Understand	4
11	Explain Wiener smoothing filter , Relation with inverse filtering and Iterative Wiener filters	Remember	4
UNIT – IV IMAGE SEGMENTATION & MORPHOLOGICAL IMAGE PROCESSING			
1	What are the derivative operators useful in image segmentation? Explain their role in segmentation	Understand	5
2	What is thresholding? Explain about global thresholding	Remember	5

3	Explain about basic adaptive thresholding process used in image segmentation	Understand	5
4	Discuss in detail about the threshold selection based on boundary characteristics	Remember	5
5	Discuss in detail about region based segmentation	Understand	5
6	What are the derivative operators useful in image segmentation? Explain their role in segmentation	Remember	5
7	Determined the Global processing via the Hough Transform for edge linking	Understand	5
8	Explain about the Global processing via graph-theoretic techniques for edge linking	Remember	5
9	Explain about Region Splitting and Merging with an example	Understand	5
10	Write about the importance of Hit-or-Miss morphological transformation operation on a digital binary image	Remember	7
11	Determined the opening operation in image morphology with examples?	Understand	7
12	Explain the closing operation in image morphology with examples?	Remember	7
13	Discuss in detail about the main steps involved in Continuous Wavelet Transform	Understand	7
UNIT – V IMAGE COMPRESSION			
1	Define and Explain about fidelity criterion with example.	Understand	6
2	List out and explain in detail about the image compression	Remember	6
3	Explain a method of generating variable length codes with an example.	Understand	6
4	Explain arithmetic encoding process with an example.	Remember	6
5	Discuss in detail about LZW coding with an example.	Understand	6
6	Explain the concept of bit plane coding method.	Remember	6
7	Determined the lossless predictive coding.	Understand	7
8	Discuss in detail about about lossy predictive coding.	Remember	7
9	Explain with a block diagram about transform coding system	Understand	7
10	Discuss in detail about about JPEG compression standard and the steps involved in JPEG compression	Understand	7

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