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INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
Dundigal, Hyderabad - 500 043

MODEL QUESTION PAPER-I

Regulations: IARE-R16
FUNDAMENTALS OF IMAGE PROCESSING
(Common for All Branches)

Time: 3 hours

Max. Marks: 70

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

- 1 a) What is meant by digital image processing? What are the applications of it? [7M]
- b) Explain Non uniform sampling is useful for what type of images. Give reasons. [7M]
- 2 a) Explain in detail about Discrete Cosine Transform and specify its properties. [7M]
- b) Is fast algorithm is applicable for computation of Hadamard transform, if so what are the problems encountered in implementation. [7M]

UNIT – II

- 3 a) Explain briefly about Median filter processing and Spatial domain high pass filtering [7M]
- b) What is a histogram of an image? Sketch histograms of basic image types [7M]
- 4 a) Describe briefly about Ideal High Pass Filter and Butterworth High Pass filter. [7M]
- b) Explain in detail smoothing spatial filters and nonlinear order static spatial filters. [7M]

UNIT – III

- 5 a) Describe constrained least square filtering technique for image restoration and derive its transfer function. [7M]
- b) Discuss and Explain, Relation with inverse filtering and Iterative Wiener filters [7M]
- 6 a) What is segmentation? Write in detail the applications of segmentation. [7M]
- b) Explain briefly the segmentation techniques that are based on finding the regions. [7M]

UNIT – IV

- 7 a) Explain about the Global processing via graph-theoretic techniques for edge linking [7M]
- b) Determine the opening operation in image morphology with examples?. [7M]
- 8 a) Explain the schematics of image compression standard JPEG. [7M]
- b) List out any two methods for linking the edge pixels to form a boundary of an object [7M]

UNIT – V

- 9 a) Explain LZW coding with an example and Explain Redundancies and their removal methods [7M]
- b) What is compression system model? Draw and explain a general compression system model. [7M]
- 10 a) Describe in detail the lossless predictive coding error free compression. [7M]
- b) Explain briefly the transform based compression. [7M]



INSTITUTE OF AERONAUTICAL ENGINEERING

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I. COURSE OBJECTIVES

The course should enable the students to:

S.No	Description
I	Understand the image fundamentals and the relationship between pixels.
II	Understand the image enhancement techniques in spatial domain and frequency domain.
III	Analyze the image restoration technique from degraded image using various filtering techniques.
IV	Design segmentation of the image for boundary detection.
V	Differentiate redundancy techniques and apply for image compression.

II. COURSE OUTCOMES (Cos):

The course should enable the students to:	
I	Understand the image fundamentals and the relationship between pixels.
II	Understand the image enhancement techniques in spatial domain and frequency domain.
III	Analyze the image restoration technique from degraded image using various filtering techniques.
IV	Design segmentation of the image for boundary detection.
V	Differentiate redundancy techniques and apply for image compression.

III. COURSE LEARNING OUTCOMES

Students who complete the course will have demonstrated the ability to do the following

S. No	Description
AEC552.01	Understand the image fundamentals, image transforms, relationship between pixels.
AEC552.02	Explore sampling and quantization in terms of images.
AEC552.03	Analyze the types of transforms, properties mathematical proofs etc.,
AEC552.04	Determine the Advanced transforms, implementations using software's
AEC552.05	Explore the Image enhancement in spatial domain, different types of point processing.
AEC552.06	Understand the Histogram , histogram manipulation, Linear and nonlinear gray level transformation
AEC552.07	Analyze the Local or neighborhood operation, median filter processing, Spatial domain high pass filtering etc.
AEC552.08	Generating filters directly in the frequency domain, obtaining frequency domain filters from spatial filters
AEC552.09	Understand the filtering in frequency domain, smoothing and sharpening filters in frequency domain.
AEC508.10	Understand the Image restoration degraded model
AEC552.11	Determine algebraic approach to restore and inverse filtering.
AEC552.12	Understand Least mean square filters
AEC552.13	Determine the constrained least square restoration, restoration, image restoration
AEC552.14	Illustrate the Image segmentation detection of discontinuities and edge linking and boundary detection.
AEC552.15	Determine the threshold and the region oriented segmentation morphological image processing dilation and erosion.
AEC552.16	Understand structuring element decomposition, the strel function, opening and closing and hit and miss transform.
AEC552.17	Describe the image compression, redundancies and removal methods.
AEC552.18	Understand fidelity criteria, image compression models, source encoder and decoder, error free compression
AEC552.19	Determine lossy compression, JPEG 2000 standards

IV. MAPPING OF SEMESTER END EXAMINATION TO COURSE LEARNING OUTCOMES:

SEE Question No.		Course learning Outcomes		Course Outcomes	Blooms Taxonomy Level
1	a	AEC552. 1	Understand the image fundamentals, image transforms, relationship between pixels.	CO1	Remember
	b	AEC552.2	Explore sampling and quantization in terms of images.	CO1	Understand
2	a	AEC552.3	Analyze the types of transforms, properties mathematical proofs etc.,	CO1	Understand
	b	AEC552.4	Determine the Advanced transforms, implementations using software's	CO1	Remember
3	a	AEC552. 5	Explore the Image enhancement in spatial domain, different types of point processing.	CO 2	Remember
	b	AEC552.6	Understand the Histogram , histogram manipulation, Linear and nonlinear gray level transformation	CO 2	Understand
4	a	AEC552. 7	Analyze the Local or neighborhood operation, median filter processing, Spatial domain high pass filtering etc.	CO 2	Understand
	b	AEC552.8	Generating filters directly in the frequency domain, obtaining frequency domain filters from spatial filters	CO 2	Remember
5	a	AEC552. 9	Understand the filtering in frequency domain, smoothing and sharpening filters in frequency domain.	CO 3	Understand
	b	AEC552. 10	Understand the Image restoration degraded model	CO 3	Understand
6	a	AEC552.11	Determine algebraic approach to restore and inverse	CO 3	Remember
	b	AEC552.13	Determine the constrained least square restoration, restoration, image restoration	CO 3	Remember
7	a	AEC552.14	Illustrate the Image segmentation detection of discontinuities and edge linking and boundary detection.	CO 4	Understand
	b	AEC552.15	Determine the threshold and the region oriented segmentation morphological image processing dilation and erosion.	CO 4	Understand
8	a	AEC552.16	Understand structuring element decomposition, the strel function, opening	CO 4	Remember
	b	AEC552.15	Determine the threshold and the region oriented segmentation morphological image processing dilation and erosion.	CO 4	Remember
9	a	AEC552.17	Describe the image compression, redundancies and removal methods.	CO 5	Understand
	b	AEC552.18	Understand fidelity criteria, image compression models, source encoder and decoder, error free compression	CO 5	Understand
10	a	AEC552.17	Describe the image compression, redundancies and removal methods.	CO 5	Understand
	b	AEC552.19	Determine lossy compression, JPEG 2000 standards	CO 5	Remember

Signature of Course Coordinator

HOD, EEE