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

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**MODEL QUESTION PAPER-I**

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B.Tech VII Semester End Examinations, November - 2019
**Regulations: R16**
**DIGITAL IMAGE PROCESSING**
(Only for ECE)

**Time: 3 hours**                                                   **Max. Marks: 70**

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

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### 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 Discrete Cosine Transform and specify its properties | [7M] |
| | b) | Is fast algorithm applicable for computation of Hadamard transform, if so what are the problems encountered in implementation. | [7M] |

### UNIT – II

| | | | |
|---|---|---|---|
| 3 | a) | Explain 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) | Discuss about Ideal High Pass Filter and Butterworth High Pass filter. | [7M] |
| | b) | Explain smoothing spatial filters and nonlinear order static spatial filters. | [7M] |

### UNIT – III

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|---|---|---|---|
| 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) | Write the applications of segmentation. | [7M] |
| | b) | Explain the segmentation techniques that are based on finding the regions. | [7M] |

### UNIT – IV

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|---|---|---|---|
| 7 | a) | Explain about the Global processing via graph-theoretic techniques for edge linking | [7M] |
| | b) | Determined the opening operation in image morphology with examples?. | [7M] |
| 8 | a) | Explain the schematics of image compression standard JPEG. | [7M] |
| | b) | Explain 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)    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]

## COURSE OBJECTIVES:
 **The course should enable the students to:**

| I | Understand the image fundamentals and mathematical transforms necessary for image processing |
|---|---|
| II | Describe the image enhancement techniques. |
| III | Evaluate the image restoration procedures |
| IV | Analyze the image compression procedures |
| V | Design the image segmentation and representation techniques. |

## COURSE OUTCOMES (COs):

| CO 1 | Review the fundamental concepts of a Digital Image Processing System. Analyze general terminology of DIP. Examine various types of Transforms |
|---|---|
| CO 2 | Examine various types of images, intensity transforms and Image Enhancement with spatial filtering. Develop FT for Image Enhancement in frequency domain. Analyze images in the frequency domain using various filters. |
| CO 3 | Evaluate the model, approaches, and filtering techniques for image Restoration. |
| CO 4 | Interpret Image Segmentation and representation techniques. Evaluate the methodologies for image segmentation, restoration etc., |
| CO 5 | Categorize various Compression techniques and Interpret Image Compression standards. |

## COURSE LEARNING OUTCOMES (CLOs):

| AEC508.01 | Understand the image fundamentals, image transforms, relationship between pixels. |
|---|---|
| AEC508.02 | Explore sampling and quantization in terms of images. |
| AEC508.03 | Analyze the types of transforms, properties mathematical proofs etc., |
| AEC508.04 | Determine the Advanced transforms, implementations using software's |
| AEC508.05 | Explore the Image enhancement in spatial domain, different types of point processing. |
| AEC508.06 | Understand the Histogram , histogram manipulation, Linear and nonlinear gray level transformation |
| AEC508.07 | Analyze the Local or neighborhood operation, median filter processing, Spatial domain high pass filtering etc. |
| AEC508.08 | Generating filters directly in the frequency domain, obtaining frequency domain filters from spatial filters |
| AEC508.09 | Understand the filtering in frequency domain, smoothing and sharpening filters in frequency domain. |
| AEC508.10 | Understand the Image restoration degraded model |
| AEC508.11 | Determine algebraic approach to restore and inverse filtering. |

| AEC508.12 | Understand Least mean square filters |
|---|---|
| AEC508.13 | Determine the constrained least square restoration, restoration, image restoration |
| AEC508.14 | Illustrate the Image segmentation detection of discontinuities and edge linking and boundary detection. |
| AEC508.15 | Determine the threshold and the region oriented segmentation morphological image processing dilation and erosion. |
| AEC508.16 | Understand structuring element decomposition, the strel function, opening and closing and hit and miss transform. |
| AEC508.17 | Describe the image compression, redundancies and removal methods. |
| AEC508.18 | Understand fidelity criteria, image compression models, source encoder and decoder, error free compression |
| AEC508.19 | Determine lossy compression, JPEG 2000 standards |

## MAPPING OF SEMESTER END EXAMINATION - COURSE OUTCOMES

| SEE Question No | | | Course Learning Outcomes | Course Outcomes | Blooms Taxonomy Level |
|---|---|---|---|---|---|
| 1 | a | AEC508. 1 | Understand the image fundamentals, image transforms, relationship between pixels. | CO 1 | Understand |
| | b | AEC508.2 | Explore sampling and quantization in terms of images. | CO 1 | Understand |
| 2 | a | AEC508.3 | Analyze the types of transforms, properties mathematical proofs etc., | CO 1 | Understand |
| | b | AEC508.4 | Determine the Advanced transforms, implementations using software's | CO 1 | Understand |
| 3 | a | AEC508. 5 | Explore the Image enhancement in spatial domain, different types of point processing. | CO 2 | Understand |
| | b | AEC508.6 | Understand the Histogram , histogram manipulation, Linear and nonlinear gray level transformation | CO 2 | Remember |
| 4 | a | AEC508. 7 | Analyze the Local or neighborhood operation, median filter processing, Spatial domain high pass filtering etc. | CO 2 | Understand |
| | b | AEC508.8 | Generating filters directly in the frequency domain, obtaining frequency domain filters from spatial filters | CO 2 | Understand |
| 5 | a | AEC508. 9 | Understand the filtering in frequency domain, smoothing and sharpening filters in frequency domain. | CO 3 | Understand |
| | b | AEC508.10 | Understand the Image restoration degraded model | CO 3 | Understand |
| 6 | a | AEC508.11 | Determine algebraic approach to restore and inverse filtering. | CO 3 | Understand |
| | b | AEC508.13 | Determine the constrained least square restoration, restoration, image restoration | CO 3 | Understand |
| 7 | a | AEC508.14 | Illustrate the Image segmentation detection of discontinuities and edge linking and boundary detection. | CO 4 | Understand |
| | b | AEC508.15 | Determine the threshold and the region oriented segmentation morphological image processing dilation and erosion. | CO 4 | Understand |
| 8 | a | AEC508.16 | Understand structuring element decomposition, the strel function, opening | CO 4 | Understand |
| | b | AEC508.15 | Determine the threshold and the region oriented segmentation morphological image processing dilation and erosion. | CO 4 | Understand |
| 9 | a | AEC508.17 | Describe the image compression, redundancies and removal methods. | CO 5 | Understand |
| | b | AEC508.18 | Understand fidelity criteria, image compression models, source encoder and decoder, error free compression | CO 5 | Understand |

| 10 | a | AEC508.17 | Describe the image compression, redundancies and removal methods. | CO 5 | Understand |
|----|---|-----------|---|------|------------|
|    | b | AEC508.19 | Determine lossy compression, JPEG 2000 standards | CO 5 | Understand |

**Signature of Course Coordinator**

Dr. S China Venkateswarlu, Professor                                                           **HOD, ECE**