**Course File**

***Subject Title/Subject Code: Digital Image Processing***

***/6CS3-01***

Semester :VI Year: III

|  |  |
| --- | --- |
| Name of the Faculty: Dr. Vivek Jain |  |
|  |  |
| E-mail id: vivek.jain@technonjr.org |  |

**Class Schedule**

**Total Number of Lectures:**42

i**)Course Objective**

**Students will be able to manipulate, enhance, and extract information from digital images.**

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**VISSION & MISSION OF INSTITUTE**

## Vision

Empoweringstudent with recent and emerging technologies to create innovative technical leaders capable of contributing to industrial and societal needs for betterment of mankind across the globe.

## Mission

**M1**: To provide dynamic learning environment to students by providing constant exposure to latest technologies by linking closely with the industries.

**M2**: To establish effective interface with industry to obtain live problems to enhance critical thinking and problem solving skills among students and consultancy projects for faculty.

**M3**: To provide avenues and opportunities to faculty for domain specific trainings and qualification upgradation.

**M4**: To develop ethical leaders with strong communication skills.

**VISION & MISSION OF DEPARTMENT**

**Department Vision**

**To be among top five well known department of Computer Science and Engineering in the state of Rajasthan in placing the students at premier industry.**

**Department Mission**

**M1:To equip students with ability to be innovative and excellence to face the challenges in the digital world.**

**M2:To prepare students with high quality employability skills catering to current trends in industries, problem solving skills, innovative pursuits and ready to face challenges in the domain and allied disciplines.**

**M3:To provide ambience for entrepreneurship and start-ups through incubation center among students.**

**M4:To encourage continuous faculty training on industry-based Development, and Innovation.**

 **PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)**

**Technical Proficiency** Graduates will have a strong foundation in core concepts, tools, and technologies relevant to their discipline.

**Career Development** Graduate will be capable of pursuing diverse career paths in field of Computer Science & Engineering with proficiency in software development/ pursue higher education an or become entrepreneurs.

**Problem-Solving** Graduates will have a strong math foundation so that they will be proficient problem solvers, capable of identifying, analyzing , and solving complex technical problems using critical thinking and creative approaches.

**Professional Attitude** Graduates will be sensitive to societal and professional environment, possess strong communication skills and will be skilled in working collaboratively within diverse teams adhering to ethical standards and professional practices.

**Learning Environment** To create a learning environment that ensures graduates continue learning throughout their careers, effortlessly adopting new technologies to stay innovative in their chosen fields and remain effective contributors in their chosen field.

**PROGRAM SPECIFIC OUTCOMES (PSO's)**

**PSO1**: Students will be able to design, develop, test, debug, deploy, analyze, troubleshoot, maintain, manage, and ensure security during the complete product lifecycle.

**PSO2**: Student will be able to apply software engineering/ information system development skills to solve problems across diverse domains.

**PSO3**: Students will be well-prepared to initiate and oversee innovative startups within their respective sectors.

**PROGRAMME OUTCOMES (POs)**

**A student will develop:**

|  |  |  |
| --- | --- | --- |
| **1** | **Engineering knowledge:** | Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems. |
| **2** | **Problem analysis:** | Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences. |
| **3** | **Design/development of solutions:** | Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations. |
| **4** | **Conduct investigations of complex problems:** | Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions. |
| **5** | **Modern tool usage:** | Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with and understanding of the limitations. |
| **6** | **The engineer and society:** | Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice. |
| **7** | **Environment and sustainability:** | Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development. |
| **8** | **Ethics:** | Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice. |
| **9** | **Individual and team work:** | Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings. |
| **10** | **Communication:** | Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions. |
| **11** | **Project management and finance:** | Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments. |
| **12** | **Life-long learning:** | Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. |

**COURSE OUTCOMES (COs) OF THE SUBJECT**

|  |  |  |
| --- | --- | --- |
| CO No.  | Mapping | Statement |
| CO36301.1 | **Remembering** | Students will be able to recall and List the fundamental concepts related to digital image representation, including pixel, resolution, color models, and image formats. |
| CO36301.2 | **Understanding** | Students will be able to classify various intensity transformation functions, such as contrast stretching, gamma correction, and logarithmic transformations. |
| CO36301.3 | **Applying** | Students will be able to apply inverse filtering techniques to reverse the effects of blurring or degradation and recover the original image as closely as possible. |
| CO36301.4 | **Analyzing** | Students will be able to analyze various image compression techniques, both lossless and lossy, to understand their principles, advantages, and limitations. |
| CO36301.5 | **Evaluate** | Students will assess the effectiveness of thresholding algorithms in segmenting images and evaluate their performance under different lighting conditions and image characteristics. |

**COS MAPPING WITH POs AND PSOs**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Outcome** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** | **PSO3** |
| **CO1** | 2 | 2 | 2 | 2 | 2 | - | - | - | 2 | 2 | - | 2 | - | - | 2 |
| **CO2** | 2 | 2 | 2 | 2 | 3 | - | - | - | 2 | 2 | - | 2 | - | - | 2 |
| **CO3** | 2 | 2 | 1 | 2 | 3 | - | - | - | 1 | 2 | - | 2 | - | - | 2 |
| **CO4** | 2 | 1 | 2 | 1 | 2 | - | - | - | 2 | 1 | - | 2 | - | - | 2 |
| **CO5** | 2 | 2 | 2 | 1 | 3 | - | - | - | 2 | 2 | - | 2 | - | - | 2 |

**UNIVERSITY ACADEMIC CALENDAR**

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**Evaluation Scheme**

FACULTY DETAILS:

Name of the Faculty : Dr. Vivek Jain

Designation : Associate Professor

Department : Computer Science Engineering

1. TARGET

 a) Percentage Pass : Result Awaited %

 b) Percentage I class: Result Awaited %

2. METHOD OF EVALUATION

2.1. Continuous Assessment Examinations (Mid-Term 1, Mid-Term 2)

2.2. Assignments / Seminars

2.3. Mini Projects

2.4. Quiz

2.5. Semester Examination Others\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. List out any new topic(s) or any innovation you would like to introduce in teaching the subject in this Semester.

1. Take the help of creative tools to stimulate creativity. Include slide presentations, demonstration or forms of visual exercises that will excite the young minds and capture their interest.

Signature of Faculty: **Signature of HOD**

**UNIVERSITY SYLLABUS**

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**PRESCRIBED BOOKS**

1. **Digital Image**. **Processing**, **Rafael** C. **Gonzalez**. University of Tennessee. Richard E. Woods. Nled Data Interactive. Pearson International Edition.

**WEEKLY TIME TABLE OF THE TEACHER**

First Time Table: with effect from (Date):

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Day** | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| Monday |  | DIPSEC-B |  | DIPSEC-**A** |  |  |  |
| Tuesday |  | DIPSEC-B |  |  |  |  |  |
| Wednesday |  |  |  | DIPSEC-A |  |  |  |
| Thursday |  |  |  |  |  |  |  |
| Friday |  | DIPSEC-B |  |  DIPSEC-A |  |  |  |
| Saturday |  | DIPSEC-B |  | DIPSEC-**A** |  |  |  |

**COURSE-PLAN**

|  |  |  |  |
| --- | --- | --- | --- |
| UNIT | Lect.No. | TOPICS | **Teaching Methods/ Teaching Aids** |
| **1** | **1** | Introduction: Objective, scope and outcome of the course. | White Board, PPT |
| 2 | 2 | Digital Image representation | White Board, PPT  |
| 2 | 3 | Sampling & Quantization | White Board, PPT |
| 2 | 4 | Steps in image Processing, Imageacquisition | White Board, PPT |
| 2 | 5 | Color image representation | White Board, PPT |
| 3 | 6 | Intensity transform functions | White Board, PPT |
| 3 | 7 | Histogram processing  | White Board, PPT  |
| 3 | 8 |  Spatial Filtering | White Board, PPT |
| 3 | 9 | Fourier transforms and its properties | White Board, PPT |
| 3 | 10 | Frequency domain filters | White Board, PPT |
| 3 | 11 | Colour models, Pseudo colouring | White Board, PPT |
| 4 | 12 | Image degradation | White Board, PPT  |
| 4 | 13 | Image restoration process | White Board, PPT |
| 4 | 14 | Noise Models | White Board, PPT |
| 4 | 15 | Noise Models | White Board, PPT |
| 4 | 16 | Noise Filters | White Board, PPT |
| 4 | 17 | Image Degradation function | White Board, PPT  |
| 4 | 18 | Inverse Filtering, Homomorphism Filtering | White Board, PPT |
| 5 | 19 | Coding redundancy, Interpixel redundancy,Psychovisual redundancy | White Board, PPT |
| 5 | 20 | Huffman Coding and its numerical | White Board, PPT |
| 5 | 21 | Arithmetic coding and its numerical | White Board, PPT |
| 5 | 22 | Lossy compression techniques | White Board, PPT  |
| 5 | 23 | JPEG Compression  | White Board, PPT |
| 6 | 24 | Point, Line and Edge Detection, Thresholding | White Board, PPT |
| 6 | 25 | Edge and Boundary linking | White Board, PPT |
| 6 | 26 | Hough transforms | White Board, PPT |
| 6 | 27 | Region Based Segmentation | White Board, PPT  |
| 6 | 28 | Boundary representation, Boundary Descriptors | White Board, PPT |

**Signature of Faculty: Signature of HOD**

**Assignment – 1**

Q1 Explain in details the different acquisition techniques of digital image processing.(CO1)

Q2 Explain in details what is the different roll of sampling & quantization in digital image processing.(CO1)

Q3 . What is image segmentation? Explain Point, Edge and Line detector.(CO2)

Q4. Explain in details different types of intensity transformation function in image processing.(CO2)

Q5

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Gray Level  | 0 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| No of Pixels | 30 | 40 | 65 | 70 | 50 | 25 | 40 | 20 |

Perform histogram stretching so that the new image has a dynamic range of (0,8).(CO5)

Q6. Explain in details Spatial filtering operation for digital image smoothing.(CO4)

Q7. Explain in details different types of noise and noise models for image restoration. Also define different probability density function of noise models and plot the frequency response.(CO4)

Q8(a) Determine and display the two-dimensional Fourier transform of a thin rectangular object. The object should be 2 by 10 pixels in size and solid white against a black background. Display the Fourier transform as both a function (i.e., as a mesh plot) and as an image plot.

(b) Fourier transform of the horizontal chirp signal shown in Figure 1 the spatial frequency characteristics of this image are zero in the vertical direction since the image is constant in this direction. The linear increase in spatial frequency in the horizontal direction is reflected in the more or less constant

Amplitude of the Fourier transform in this direction. (CO5)



**Figure 1**

**Assignment – 2**

1(a) What is the difference between gray-level slicing with background suppressed and without background suppression? (CO1)

1(b) What is meant by bit-plane slicing? Give the algorithm to obtain the

(i) eighth bit plane.

(ii) sixth bit plane.

1(c) In spatial domain, derive the equation for Laplacian masks. Also, draw the different forms of the Laplacian mask.

Q2 Load one frame of the MRI image set and apply the sharpening soble filter to detect horizontal edges. Then apply the Sobel filter to detect the vertical edges and combine the two edge detectors. Plot both the horizontal and combined edge detectors.(CO4)

Q3 (a) Sketch the block diagram for homomorphic filtering along with the equations corresponding to each block. (CO2)

(b) Which filter is best suited to remove salt and pepper noise? Explain.

(c) Sate the algorithm for adaptive median filter. Explain various statistical parameters used.

Q4 Configuration for adaptive noise cancellation. The reference channel carries a signal, *N*’ (*n*), that is correlated with the noise, *N* (*n*), but not with the signal of interest, *x*(*n*). The adaptive filter produces an estimate of the noise, *N*\*(*n*) that is in the signal. In some applications, multiple reference channels are used to provide a more accurate representation of the background noise.(CO5)

Q5 (a) Sate the algorithm for adaptive median filter. Explain various statistical parameters used.

(b) Explain inverse and Weiner filtering using suitable equations. Give the condition when Weiner filtering reduces to inverse filtering. (CO4)

Q6 Use the data in the table to obtain the arithmetic code word for the message a1 a2 a3 a3 a4. (CO2)



Q7 . Explain the following morphological algorithms in detail using suitable example(CO4)

(a) Boundary extraction.

(b) Region filling

(c) Connected components

(d) Thinning

(e) Thickening

Q8 Define different ways of image segmentation. Which method is better & why?(CO2)

Q9 Explain canny edge detector algorithm clearly stating different steps.(CO2)

 **QUIZ QUESTIONS**

1.What is Digital Image Processing?
a) It’s an application that alters digital videos
b) It’s a software that allows altering digital pictures
c) It’s a system that manipulates digital medias
d) It’s a machine that allows altering digital images

1. Which of the following process helps in Image enhancement?
a) Digital Image Processing
b) Analog Image Processing
c) Both a and b
d) None of the above
2. Among the following, functions that can be performed by digital image processing is?
a) Fast image storage and retrieval
b) Controlled viewing
c) Image reformatting
d) All of the above
3. Which of the following is an example of Digital Image Processing?
a) Computer Graphics
b) Pixels
c) Camera Mechanism
d) All of the mentioned
4. What are the categories of digital image processing?
a) Image Enhancement
b) Image Classification and Analysis
c) Image Transformation
d) All of the mentioned
5. How does picture formation in the eye vary from image formation in a camera?
a) Fixed focal length
b) Varying distance between lens and imaging plane
c) No difference
d) Variable focal length
6. What are the names of the various colour image processing categories?
a) Pseudo-color and Multi-color processing
b) Half-color and pseudo-color processing
c) Full-color and pseudo-color processing
d) Half-color and full-color processing

8. Which characteristics are taken together in chromaticity?
a) Hue and Saturation
b) Hue and Brightness
c) Saturation, Hue, and Brightness
d) Saturation and Brightness

1. Which of the following statement describe the term pixel depth?
a) It is the number of units used to represent each pixel in RGB space
b) It is the number of mm used to represent each pixel in RGB space
c) It is the number of bytes used to represent each pixel in RGB space
d) It is the number of bits used to represent each pixel in RGB space
2. The aliasing effect on an image can be reduced using which of the following methods?
a) By reducing the high-frequency components of image by clarifying the image
b) By increasing the high-frequency components of image by clarifying the image
c) By increasing the high-frequency components of image by blurring the image
d) By reducing the high-frequency components of image by blurring the image
3. Which of the following is the first and foremost step in Image Processing?
a) Image acquisition
b) Segmentation
c) Image enhancement
d) Image restoration
4. Which of the following image processing approaches is the fastest, most accurate, and flexible?
a) Photographic
b) Electronic
c) Digital
d) Optical
5. Which of the following is the next step in image processing after compression?
a) Representation and description
b) Morphological processing
c) Segmentation
d) Wavelets
6. \_\_\_\_\_\_\_\_\_\_\_ determines the quality of a digital image.
a) The discrete gray levels
b) The number of samples
c) discrete gray levels & number of samples
d) None of the mentioned
7. Image processing involves how many steps?
a) 7
b) 8
c) 13
d) 10
8. Which of the following is the abbreviation of JPEG?
a) Joint Photographic Experts Group
b) Joint Photographs Expansion Group
c) Joint Photographic Expanded Group
d) Joint Photographic Expansion Group
9. Which of the following is the role played by segmentation in image processing?
a) Deals with property in which images are subdivided successively into smaller regions
b) Deals with partitioning an image into its constituent parts or objects
c) Deals with extracting attributes that result in some quantitative information of interest
d) Deals with techniques for reducing the storage required saving an image, or the bandwidth required transmitting it
10. The digitization process, in which the digital image comprises M rows and N columns, necessitates choices for M, N, and the number of grey levels per pixel, L. M and N must have which of the following values?
a) M have to be positive and N have to be negative integer
b) M have to be negative and N have to be positive integer
c) M and N have to be negative integer
d) M and N have to be positive integer
11. Which of the following tool is used in tasks such as zooming, shrinking, rotating, etc.?
a) Filters
b) Sampling
c) Interpolation
d) None of the Mentioned
12. The effect caused by the use of an insufficient number of intensity levels in smooth areas of a digital image \_\_\_\_\_\_\_\_\_\_\_\_\_
a) False Contouring
b) Interpolation
c) Gaussian smooth
d) Contouring
13. What is the procedure done on a digital image to alter the values of its individual pixels known as?
a) Geometric Spacial Transformation
b) Single Pixel Operation
c) Image Registration
d) Neighbourhood Operations
14. Points whose locations are known exactly in the input and reference images are used in Geometric Spacial Transformation.
a) Known points
b) Key-points
c) Réseau points
d) Tie points
15. \_\_\_\_\_\_\_\_\_\_\_ is a commercial use of Image Subtraction.
a) MRI scan
b) CT scan
c) Mask mode radiography
d) None of the Mentioned
16. Approaches to image processing that work directly on the pixels of incoming image work in \_\_\_\_\_\_\_\_\_\_\_\_
a) Spatial domain
b) Inverse transformation
c) Transform domain
d) None of the Mentioned
17. Which of the following in an image can be removed by using a smoothing filter?
a) Sharp transitions of brightness levels
b) Sharp transitions of gray levels
c) Smooth transitions of gray levels
d) Smooth transitions of brightness levels
18. Region of Interest (ROI) operations is generally known as \_\_\_\_\_\_\_
a) Masking
b) Dilation
c) Shading correction
d) None of the Mentioned
19. Which of the following comes under the application of image blurring?
a) Image segmentation
b) Object motion
c) Object detection
d) Gross representation
20. Which of the following filter’s responses is based on the pixels ranking?
a) Sharpening filters
b) Nonlinear smoothing filters
c) Geometric mean filter
d) Linear smoothing filters
21. Which of the following illustrates three main types of image enhancing functions?
a) Linear, logarithmic and power law
b) Linear, logarithmic and inverse law
c) Linear, exponential and inverse law
d) Power law, logarithmic and inverse law

30. Which of the following is the primary objective of sharpening of an image?
a) Decrease the brightness of the image
b) Increase the brightness of the image
c) Highlight fine details in the image
d) Blurring the image

1. Which of the following operation is done on the pixels in sharpening the image, in the spatial domain?
a) Differentiation
b) Median
c) Integration
d) Average

**QUIZ ANSWER KEY**

**Q1. B Q2. C Q3. D Q4. D Q5. D Q6 D Q7. C Q8. A Q9. D Q10. D Q11. A Q12. C Q13. B**

**Q14. C Q15. D Q16. A Q17. B Q18. D Q19. C Q20. A Q21. B Q22. D Q23. C Q24. A Q25 B**

**Q26. A Q27. D Q28. B Q29. D Q30. C**

**Mid Term Paper-I**

**TECHNO INDIA NJR INSTITUTE OF TECHNOLOGY, UDAIPUR**

**B. TECH 3rd – YEAR (VI SEM.) – MT-I**

**Digital Image Processing (6CS3-01**)

**Time:** 2 Hr **Max. Marks:** 70

**Note:**

1. The paper is divided into 2 parts: Part-A and, Part-B.
2. Part-A contains 10 questions and carries 2 mark each.
3. Part-B contains 5 questions. Each question is having two options and carries 10 marks each.

Part- A (20 Marks)

|  |  |  |
| --- | --- | --- |
|  | Mention the name of different application of digital image processing. | CO1 |
|  | Define digital image. | CO1 |
|  | Define image enhancement in digital image processing. | CO1 |
|  | Define weber’s law for digital image processing. | CO1 |
|  | Explains linear intensity transformation function. | CO2 |
|  | What is the value of central pixel if it is smoothened by 3\*3 mean filter: f(x,y)= 1 2 2 3 2 1 4 2 1 1 2 1 | CO2 |
|  | What do you mean by image negative? | CO2 |
|  | What do you mean contrast stretching? | CO2 |
|  | Define noise of the image. | CO3 |
|  | What do you mean by image restoration? | CO3 |

Part- B (50 Marks)

|  |  |
| --- | --- |
| 1. Explain in detail different stages of digital image processing
 | CO1 |
| OR |
| 1. A. Explain in detail image acquisition process in digital image storage.
 | CO1 |

|  |  |
| --- | --- |
| 1. Explain in detail image sampling and Quantization process in digital image storage.
 | CO1 |
| OR |
| 1. Explain in detail color models in details mention below:
* HSV
* YIQ
* RGB
 | CO1 |

|  |  |
| --- | --- |
| 1. Explain sharpening spatial filtering in digital image processing in detail.
 | CO2 |
| OR |
| 1. Explain frequency domain filter operation in digital image processing in detail.
 | CO2 |

|  |  |
| --- | --- |
| 1. Explain following Terms :
2. Contrast Stretching (b) Bit Extraction
 | CO2 |
| OR |
| 1. Compute the histogram of output image obtained by enhancing the input histogram equalization techniques. What is the purpose of histogram equalization.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Gray Level  | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| No. of Pixels | 400 | 700 | 1350 | 2500 | 3000 | 1500 | 550 | 0 |

 | CO2 |

|  |  |
| --- | --- |
| 1. Explain in detail different noise model in detail.
 | CO3 |
| OR |
| 1. Explain in detail Homomorphism Filtering. Also derive the expression for its transfer function.
 | CO3 |

**Marks and Gap Analysis of Mid-Term 1**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sr. No | RTU Roll Number | Name of the Student | M-1 Marks (70) | Remark( Remedial Class need or not – Y/N ) |
| 1 | 21ETCCS001 | AARSH BHARTI | 63 | N |
| 2 | 21ETCCS002 | MS AASTHA DAKHERA | 70 | N |
| 3 | 21ETCCS003 | ABHISHEK PRAJAPAT | 59 | Y |
| 4 | 21ETCCS005 | AKSHANSH SONI | 61 | Y |
| 5 | 21ETCCS006 | AKSHAT SINGH CHOUHAN | 66 | N |
| 6 | 21ETCCS007 | ANIRUDH SINGH RAJPUROHIT | 59 | Y |
| 7 | 21ETCCS008 | ANISH SINGHAL | 66 | N |
| 8 | 21ETCCS009 | ANJALI SONI | 68 | N |
| 9 | 21ETCCS010 | ANURAG MENARIA | 63 | N |
| 10 | 21ETCCS011 | ANUSHKA VIJAY | 66 | N |
| 11 | 21ETCCS012 | APURVA LODHA | 70 | N |
| 12 | 21ETCCS013 | ARUN LOHAR | 66 | N |
| 13 | 21ETCCS014 | ARVIND SINGH | 59 | Y |
| 14 | 21ETCCS015 | ARVIND SUTHAR | 61 | Y |
| 15 | 21ETCCS016 | AVANI JOSHI | 61 | Y |
| 16 | 21ETCCS017 | AYAN KHAN | 63 | N |
| 17 | 21ETCCS018 | AYUSH JHOTA | 68 | N |
| 18 | 21ETCCS019 | AYUSH TALESARA | 59 | Y |
| 19 | 21ETCCS020 | BHAVYA MEHTA | 63 | N |
| 20 | 21ETCCS021 | BHERU SINGH PANWAR | 63 | N |
| 21 | 21ETCCS022 | MS BHUMIKA VARDAR | 66 | N |
| 22 | 21ETCCS025 | CHINMAY MENARIA | 63 | N |
| 23 | 21ETCCS026 | DAKSH VYAS | 61 | Y |
| 24 | 21ETCCS027 | DEEPAK DHAKAR | 61 | Y |
| 25 | 21ETCCS029 | DHIREN SUHALKA | 63 | N |
| 26 | 21ETCCS030 | DHRUV BAGORA | 66 | N |
| 27 | 21ETCCS031 | DIKSHA AGARWAL | 70 | N |
| 28 | 21ETCCS032 | DINESH AUDICHYA | 61 | Y |
| 29 | 21ETCCS034 | DIVYANSHU MENARIA | 66 | N |
| 30 | 21ETCCS035 | DIVYANSHU SAHU | 61 | Y |
| 31 | 21ETCCS036 | DURGA SANKAR DANGI | 61 | Y |
| 32 | 21ETCCS037 | GAGAN MANGAL | 61 | Y |
| 33 | 21ETCCS038 | GARVITA BAYA | 68 | N |
| 34 | 21ETCCS039 | GARVITA JAIN | 70 | N |
| 35 | 21ETCCS040 | GAZI AMAN KHAN | 61 | Y |
| 36 | 21ETCCS041 | HARSH | 66 | N |
| 37 | 21ETCCS042 | HARSH SONI | 63 | N |
| 38 | 21ETCCS043 | HARSHAL PALIWAL | 63 | N |
| 39 | 21ETCCS044 | HARSHIT PUROHIT | 61 | Y |
| 40 | 21ETCCS045 | HARSHIT SHARMA | 66 | N |
| 41 | 21ETCCS046 | HARSHITA RATHORE | 59 | Y |
| 42 | 21ETCCS047 | HEET DOSI | 63 | N |
| 43 | 21ETCCS048 | MS HETAL SHARMA | 68 | N |
| 44 | 21ETCCS049 | JAHNAVI JOSHI | 70 | N |
| 45 | 21ETCCS050 | JAINIL JAIN | 63 | N |
| 46 | 21ETCCS051 | JASWANT SINGH RAO | 61 | Y |
| 47 | 21ETCCS052 | JATIN VASHISHTHA | 68 | N |
| 48 | 21ETCCS053 | JAY JOSHI | 61 | Y |
| 49 | 21ETCCS054 | JAYDEEP DANGI | 68 | N |
| 50 | 21ETCCS055 | JIGYASA CHATURVEDI | 66 | N |
| 51 | 21ETCCS056 | KAILASH JOSHI | 66 | N |
| 52 | 21ETCCS057 | KAMLESH KUMAR GHANCHI | 63 | N |
| 53 | 21ETCCS058 | KANISHKA PARMAR | 70 | N |
| 54 | 21ETCCS059 | KASHVI PANDEY | 63 | N |
| 55 | 21ETCCS060 | KHUSHAL PALIWAL | 59 | Y |
| 56 | 21ETCCS061 | KHUSHI GAHLOT | 66 | N |
| 57 | 21ETCCS062 | KHUSHI VANAWAT | 61 | Y |
| 58 | 21ETCCS064 | KUNAL CHOUBISA | 66 | N |
| 59 | 21ETCCS065 | KUNAL MENARIA | 63 | N |
| 60 | 21ETCCS066 | KUNAL PALIWAL | 59 | Y |
| 61 | 21ETCCS067 | KUNAL SHARMA | 66 | N |
| 62 | 21ETCCS068 | KUNIKA KADECHA | 61 | Y |
| 63 | 21ETCCS069 | LALITA DANGI | 70 | N |
| 64 | 21ETCCS070 | LAVISHA JAIN | 68 | N |
| 65 | 21ETCCS071 | LOKANTIK JAIN | 68 | N |
| 66 | 21ETCCS073 | MAHAK BANSAL | 66 | N |
| 67 | 21ETCCS074 | MANSI GEHLOT | 61 | Y |
| 68 | 21ETCCS075 | MAYANK KANERIYA | 68 | N |
| 69 | 21ETCCS076 | MAYANK MALIWAL | 63 | N |
| 70 | 21ETCCS078 | MITANSH JAIN | 59 | Y |
| 71 | 21ETCCS079 | MOHAMMED OWAIS KHAN | 63 | N |
| 72 | 21ETCCS081 | NAVNEET ANAND | 63 | N |
| 73 | 21ETCCS082 | NEHAL DHING | 63 | N |
| 74 | 21ETCCS084 | NIPUN MALI | 66 | N |
| 75 | 21ETCCS085 | NISHA LOHAR | 70 | N |
| 76 | 21ETCCS086 | PRADHUMAN SINGH CHAUDHARY | 66 | N |
| 77 | 21ETCCS087 | PRANJAL SINGHVI | 63 | N |
| 78 | 21ETCCS088 | RAJAT PATIDAR | 59 | Y |
| 79 | 21ETCCS089 | RIYA JAIN | 70 | N |
| 80 | 21ETCCS090 | ROHIN GANG | 59 | Y |
| 81 | 21ETCCS091 | RUPAL SONI | 68 | N |
| 82 | 21ETCCS092 | SAHIL SOLANKI | 63 | N |
| 83 | 21ETCCS093 | SARGAM JAIN | 68 | N |
| 84 | 21ETCCS094 | SATYEN KHARADI | 61 | Y |
| 85 | 21ETCCS095 | SHASHANK MENARIA | 66 | N |
| 86 | 21ETCCS096 | SHUBHAM DAS | 59 | Y |
| 87 | 21ETCCS097 | SUDEEP ROY | 68 | N |
| 88 | 21ETCCS098 | SUMIT VASITA | 59 | Y |
| 89 | 21ETCCS099 | SUYASH SONI | 59 | Y |
| 90 | 21ETCCS100 | MS TANISHA KUMAWAT | 66 | N |
| 91 | 21ETCCS101 | TUSHAR YADAV | 59 | Y |
| 92 | 21ETCCS102 | VAIBHAV GARG | 68 | N |
| 93 | 21ETCCS103 | VAIBHAV SONI | 70 | N |
| 94 | 21ETCCS104 | VARUN SHARMA | 59 | Y |
| 95 | 21ETCCS105 | VEDANSHI PAREEK | 59 | Y |
| 96 | 21ETCCS106 | VEDAS DIXIT | 68 | N |
| 97 | 21ETCCS107 | VIKRAM SINGH SISODIYA | 66 | N |
| 98 | 21ETCCS108 | VIMANYU P SHARMA | 61 | Y |
| 99 | 21ETCCS109 | VISHAL KUMAWAT | 66 | N |
| 100 | 21ETCCS110 | VISHAL PUSHKARNA | 61 | Y |
| 101 | 21ETCCS111 | VYOM BHATT | 63 | N |
| 102 | 21ETCCS112 | YASH JAIN | 66 | N |
| 103 | 21ETCCS113 | YASH JOSHI | 66 | N |
| 104 | 21ETCCS114 | YASH PURI GOSWAMI | 66 | N |
| 105 | 21ETCCS115 | YOGESH JAIPAL | 59 | Y |
| 106 | 21ETCCS116 | MS YUVIKA CHOUDHARY | 61 | Y |
| 107 | 21ETCCS117 | YUVRAJ SINGH KANAWAT | 63 | N |
| 108 | 21ETCCS300 | NEELAM KATARIYA | 63 | N |
| 109 | 21ETCCS400 | SHABBIR HUSAIN | 59 | Y |
| 110 | 21ETCCS401 | ALI HUSSAIN | 66 | N |
| 111 | 22ETCCS200 | SAURABH SONI | 68 | N |

**\***(Y, if obtained marks are <=70%)

**Signature of Faculty: Signature of HOD**

 **Remedial Action Taken to Remove the Gaps (After Mid- Term 1)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| S.no. | University Roll no. | Name of Student | Topics to be discussed in Remedial Class | Schedule Date of Remedial Class  | OutcomeAchieved |
|  | 21ETCCS003 | ABHISHEK PRAJAPAT | Fundamentals of digital image processing, Color Image processing, Intensity Transformation , Image Filtering Operation | 2-5-2023 to 20-5-2023 | CO1,CO2,CO3 |
|  | 21ETCCS005 | AKSHANSH SONI |
|  | 21ETCCS007 | ANIRUDH SINGH RAJPUROHIT |
|  | 21ETCCS014 | ARVIND SINGH |
|  | 21ETCCS015 | ARVIND SUTHAR |
|  | 21ETCCS016 | AVANI JOSHI |
|  | 21ETCCS019 | AYUSH TALESARA |
|  | 21ETCCS026 | DAKSH VYAS |
|  | 21ETCCS027 | DEEPAK DHAKAR |
|  | 21ETCCS032 | DINESH AUDICHYA |
|  | 21ETCCS035 | DIVYANSHU SAHU |
|  | 21ETCCS036 | DURGA SANKAR DANGI |
|  | 21ETCCS037 | GAGAN MANGAL |
|  | 21ETCCS040 | GAZI AMAN KHAN |
|  | 21ETCCS044 | HARSHIT PUROHIT |
|  | 21ETCCS046 | HARSHITA RATHORE |
|  | 21ETCCS051 | JASWANT SINGH RAO |
|  | 21ETCCS053 | JAY JOSHI |
|  | 21ETCCS060 | KHUSHAL PALIWAL |
|  | 21ETCCS062 | KHUSHI VANAWAT |
|  | 21ETCCS066 | KUNAL PALIWAL |
|  | 21ETCCS068 | KUNIKA KADECHA |
|  | 21ETCCS074 | MANSI GEHLOT |
|  | 21ETCCS078 | MITANSH JAIN |
|  | 21ETCCS088 | RAJAT PATIDAR |
|  | 21ETCCS090 | ROHIN GANG |
|  | 21ETCCS094 | SATYEN KHARADI |
|  | 21ETCCS096 | SHUBHAM DAS |
|  | 21ETCCS098 | SUMIT VASITA |
|  | 21ETCCS099 | SUYASH SONI |
|  | 21ETCCS101 | TUSHAR YADAV |
|  | 21ETCCS104 | VARUN SHARMA |
|  | 21ETCCS105 | VEDANSHI PAREEK |
|  | 21ETCCS108 | VIMANYU P SHARMA |
|  | 21ETCCS110 | VISHAL PUSHKARNA |
|  | 21ETCCS115 | YOGESH JAIPAL |
|  | 21ETCCS116 | MS YUVIKA CHOUDHARY |
|  | 21ETCCS400 | SHABBIR HUSAIN |

**Signature of Faculty: Signature of HOD**

**TECHNO INDIA NJR INSTITUTE OF TECHNOLOGY, UDAIPUR**

**B. TECH 3rd – YEAR (VI SEM.) – MT-II**

**Digital Image Processing** **(6CS3-01**)

**Time:** 2 Hr **Max. Marks:** 70

**Note:**

1. The paper is divided into 2 parts: Part-A and, Part-B.
2. Part-A contains 10 questions and carries 2 mark each.
3. Part-B contains 5 questions. Each question is having two options and carries 10 marks each.

**Part- A (20 Marks)**

|  |  |  |
| --- | --- | --- |
|  | What is the point spreading function in digital image processing? | CO3 |
|  | List the properties involved in degradation model in digital image processing. | CO3 |
|  | Define inter pixel redundancy. | CO4 |
|  | Define the need of image compression. | CO4 |
|  | What are the components of a general compression model in digital image processing? | CO4 |
|  | What is the need for compression techniques? | CO4 |
|  | Define image segmentation. | CO5 |
|  | Define Line detection process. | CO5 |
|  | Define global thresholding. | CO5 |
|  | What do you mean by region merging in digital image processing? | CO5 |

**Part- B (50 Marks)**

|  |  |
| --- | --- |
| 1. Explain in details different types of the noise in digital image.
 | CO3 |
| OR |
| 1. Explain in detail Inverse Filtering. Also derive the expression for its output.
 | CO3 |
| 3. Find the Huffman coding for given seven letters along with probability of occurrence

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 1. Letters
 | 1. B
 | 1. A
 | 1. G
 | 1. D
 | 1. E
 | 1. C
 | 1. F
 |
| 1. Probability
 | 1. 0.110
 | 1. 0.154
 | 1. 0.011
 | 1. 0.063
 | 1. 0.072
 | 1. 0.072
 | 1. 0.015
 |

 | CO4 |
| OR |
| 1. Encode **‘ace’** using Arithmetic coding

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Letters | a | b | c | d | e |
| Probability | 0.30 | 0.15 | 0.25 | 0.10 | 0.20 |

 | CO4 |
| 1. Define Lossy compression techniques. Disadvantage of Lossy compression process. Describe in detail all types of Lossy compression techniques.
 | CO4 |
| OR |
|  6. Define Lossless compression techniques. Disadvantage of Lossless compression process. Describe in detail all types of Lossless compression techniques. | CO4 |
| 7. Define all types of thresholding in detail. | CO5 |
| OR |
| 8. Explain in detail edge detection process of image in detail. | CO5 |

|  |  |
| --- | --- |
| 9. Explain in detail all types of Region Based Segmentation. | CO5 |
| OR |
| 1. Explain in detail Hough transforms for edge linking
 | CO5 |

**Mid Term Exam – II**

**Marks and Gap Analysis of Mid-Term II**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sr. No | RTU Roll Number | Name of the Student | M-1 Marks (70) | Remark( Remedial Class need or not – Y/N ) |
| 1 | 21ETCCS001 | AARSH BHARTI | 63 | Y |
| 2 | 21ETCCS002 | MS AASTHA DAKHERA | 70 | N |
| 3 | 21ETCCS003 | ABHISHEK PRAJAPAT | 58 | Y |
| 4 | 21ETCCS005 | AKSHANSH SONI | 60 | Y |
| 5 | 21ETCCS006 | AKSHAT SINGH CHOUHAN | 65 | N |
| 6 | 21ETCCS007 | ANIRUDH SINGH RAJPUROHIT | 58 | Y |
| 7 | 21ETCCS008 | ANISH SINGHAL | 65 | N |
| 8 | 21ETCCS009 | ANJALI SONI | 67 | N |
| 9 | 21ETCCS010 | ANURAG MENARIA | 63 | Y |
| 10 | 21ETCCS011 | ANUSHKA VIJAY | 65 | N |
| 11 | 21ETCCS012 | APURVA LODHA | 70 | N |
| 12 | 21ETCCS013 | ARUN LOHAR | 65 | N |
| 13 | 21ETCCS014 | ARVIND SINGH | 58 | Y |
| 14 | 21ETCCS015 | ARVIND SUTHAR | 60 | Y |
| 15 | 21ETCCS016 | AVANI JOSHI | 60 | Y |
| 16 | 21ETCCS017 | AYAN KHAN | 63 | Y |
| 17 | 21ETCCS018 | AYUSH JHOTA | 67 | N |
| 18 | 21ETCCS019 | AYUSH TALESARA | 58 | Y |
| 19 | 21ETCCS020 | BHAVYA MEHTA | 63 | Y |
| 20 | 21ETCCS021 | BHERU SINGH PANWAR | 63 | Y |
| 21 | 21ETCCS022 | MS BHUMIKA VARDAR | 65 | N |
| 22 | 21ETCCS025 | CHINMAY MENARIA | 63 | Y |
| 23 | 21ETCCS026 | DAKSH VYAS | 60 | Y |
| 24 | 21ETCCS027 | DEEPAK DHAKAR | 60 | Y |
| 25 | 21ETCCS029 | DHIREN SUHALKA | 63 | Y |
| 26 | 21ETCCS030 | DHRUV BAGORA | 65 | N |
| 27 | 21ETCCS031 | DIKSHA AGARWAL | 70 | N |
| 28 | 21ETCCS032 | DINESH AUDICHYA | 60 | Y |
| 29 | 21ETCCS034 | DIVYANSHU MENARIA | 65 | N |
| 30 | 21ETCCS035 | DIVYANSHU SAHU | 60 | Y |
| 31 | 21ETCCS036 | DURGA SANKAR DANGI | 60 | Y |
| 32 | 21ETCCS037 | GAGAN MANGAL | 60 | Y |
| 33 | 21ETCCS038 | GARVITA BAYA | 67 | N |
| 34 | 21ETCCS039 | GARVITA JAIN | 70 | N |
| 35 | 21ETCCS040 | GAZI AMAN KHAN | 60 | Y |
| 36 | 21ETCCS041 | HARSH | 65 | N |
| 37 | 21ETCCS042 | HARSH SONI | 63 | Y |
| 38 | 21ETCCS043 | HARSHAL PALIWAL | 63 | Y |
| 39 | 21ETCCS044 | HARSHIT PUROHIT | 60 | Y |
| 40 | 21ETCCS045 | HARSHIT SHARMA | 65 | N |
| 41 | 21ETCCS046 | HARSHITA RATHORE | 58 | Y |
| 42 | 21ETCCS047 | HEET DOSI | 63 | Y |
| 43 | 21ETCCS048 | MS HETAL SHARMA | 67 | N |
| 44 | 21ETCCS049 | JAHNAVI JOSHI | 70 | N |
| 45 | 21ETCCS050 | JAINIL JAIN | 63 | Y |
| 46 | 21ETCCS051 | JASWANT SINGH RAO | 60 | Y |
| 47 | 21ETCCS052 | JATIN VASHISHTHA | 67 | N |
| 48 | 21ETCCS053 | JAY JOSHI | 60 | Y |
| 49 | 21ETCCS054 | JAYDEEP DANGI | 67 | N |
| 50 | 21ETCCS055 | JIGYASA CHATURVEDI | 65 | N |
| 51 | 21ETCCS056 | KAILASH JOSHI | 65 | N |
| 52 | 21ETCCS057 | KAMLESH KUMAR GHANCHI | 63 | Y |
| 53 | 21ETCCS058 | KANISHKA PARMAR | 70 | N |
| 54 | 21ETCCS059 | KASHVI PANDEY | 63 | Y |
| 55 | 21ETCCS060 | KHUSHAL PALIWAL | 58 | Y |
| 56 | 21ETCCS061 | KHUSHI GAHLOT | 65 | N |
| 57 | 21ETCCS062 | KHUSHI VANAWAT | 60 | Y |
| 58 | 21ETCCS064 | KUNAL CHOUBISA | 65 | N |
| 59 | 21ETCCS065 | KUNAL MENARIA | 63 | Y |
| 60 | 21ETCCS066 | KUNAL PALIWAL | 58 | Y |
| 61 | 21ETCCS067 | KUNAL SHARMA | 65 | N |
| 62 | 21ETCCS068 | KUNIKA KADECHA | 60 | Y |
| 63 | 21ETCCS069 | LALITA DANGI | 70 | N |
| 64 | 21ETCCS070 | LAVISHA JAIN | 67 | N |
| 65 | 21ETCCS071 | LOKANTIK JAIN | 67 | N |
| 66 | 21ETCCS073 | MAHAK BANSAL | 65 | N |
| 67 | 21ETCCS074 | MANSI GEHLOT | 60 | Y |
| 68 | 21ETCCS075 | MAYANK KANERIYA | 67 | N |
| 69 | 21ETCCS076 | MAYANK MALIWAL | 63 | Y |
| 70 | 21ETCCS078 | MITANSH JAIN | 58 | Y |
| 71 | 21ETCCS079 | MOHAMMED OWAIS KHAN | 63 | Y |
| 72 | 21ETCCS081 | NAVNEET ANAND | 63 | Y |
| 73 | 21ETCCS082 | NEHAL DHING | 63 | Y |
| 74 | 21ETCCS084 | NIPUN MALI | 65 | N |
| 75 | 21ETCCS085 | NISHA LOHAR | 70 | N |
| 76 | 21ETCCS086 | PRADHUMAN SINGH CHAUDHARY | 65 | N |
| 77 | 21ETCCS087 | PRANJAL SINGHVI | 63 | Y |
| 78 | 21ETCCS088 | RAJAT PATIDAR | 58 | Y |
| 79 | 21ETCCS089 | RIYA JAIN | 70 | N |
| 80 | 21ETCCS090 | ROHIN GANG | 58 | Y |
| 81 | 21ETCCS091 | RUPAL SONI | 67 | N |
| 82 | 21ETCCS092 | SAHIL SOLANKI | 63 | Y |
| 83 | 21ETCCS093 | SARGAM JAIN | 67 | N |
| 84 | 21ETCCS094 | SATYEN KHARADI | 60 | Y |
| 85 | 21ETCCS095 | SHASHANK MENARIA | 65 | N |
| 86 | 21ETCCS096 | SHUBHAM DAS | 58 | Y |
| 87 | 21ETCCS097 | SUDEEP ROY | 67 | N |
| 88 | 21ETCCS098 | SUMIT VASITA | 58 | Y |
| 89 | 21ETCCS099 | SUYASH SONI | 58 | Y |
| 90 | 21ETCCS100 | MS TANISHA KUMAWAT | 65 | N |
| 91 | 21ETCCS101 | TUSHAR YADAV | 58 | Y |
| 92 | 21ETCCS102 | VAIBHAV GARG | 67 | N |
| 93 | 21ETCCS103 | VAIBHAV SONI | 70 | N |
| 94 | 21ETCCS104 | VARUN SHARMA | 58 | Y |
| 95 | 21ETCCS105 | VEDANSHI PAREEK | 58 | Y |
| 96 | 21ETCCS106 | VEDAS DIXIT | 67 | N |
| 97 | 21ETCCS107 | VIKRAM SINGH SISODIYA | 65 | N |
| 98 | 21ETCCS108 | VIMANYU P SHARMA | 60 | Y |
| 99 | 21ETCCS109 | VISHAL KUMAWAT | 65 | N |
| 100 | 21ETCCS110 | VISHAL PUSHKARNA | 60 | Y |
| 101 | 21ETCCS111 | VYOM BHATT | 63 | Y |
| 102 | 21ETCCS112 | YASH JAIN | 65 | N |
| 103 | 21ETCCS113 | YASH JOSHI | 65 | N |
| 104 | 21ETCCS114 | YASH PURI GOSWAMI | 65 | N |
| 105 | 21ETCCS115 | YOGESH JAIPAL | 58 | Y |
| 106 | 21ETCCS116 | MS YUVIKA CHOUDHARY | 60 | Y |
| 107 | 21ETCCS117 | YUVRAJ SINGH KANAWAT | 63 | Y |
| 108 | 21ETCCS300 | NEELAM KATARIYA | 63 | Y |
| 109 | 21ETCCS400 | SHABBIR HUSAIN | 58 | Y |
| 110 | 21ETCCS401 | ALI HUSSAIN | 65 | N |
| 111 | 22ETCCS200 | SAURABH SONI | 67 | N |

**\***(Y, if obtained marks are <70%)

**Signature of Faculty: Signature of HOD**

**Remedial Action Taken to Remove the Gaps (After Mid- Term 1I)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Sr.No. | University Roll no. | Name of Student | Topics to be discussed in Remedial Class | Schedule Date of Remedial Class  | Course Outcome |
| 1 | 21ETCCS001 | AARSH BHARTI | Degradation and Restoration of Image, Image Compression Techniques , Image Thresholding and Segmentation Operation | 2-6-2023 to 16-6-2023 | CO3,CO4,CO5 |
| 2 | 21ETCCS003 | ABHISHEK PRAJAPAT |
| 3 | 21ETCCS005 | AKSHANSH SONI |
| 4 | 21ETCCS007 | ANIRUDH SINGH RAJPUROHIT |
| 5 | 21ETCCS010 | ANURAG MENARIA |
| 6 | 21ETCCS014 | ARVIND SINGH |
| 7 | 21ETCCS015 | ARVIND SUTHAR |
| 8 | 21ETCCS016 | AVANI JOSHI |
| 9 | 21ETCCS017 | AYAN KHAN |
| 10 | 21ETCCS019 | AYUSH TALESARA |
| 11 | 21ETCCS020 | BHAVYA MEHTA |
| 12 | 21ETCCS021 | BHERU SINGH PANWAR |
| 13 | 21ETCCS025 | CHINMAY MENARIA |
| 14 | 21ETCCS026 | DAKSH VYAS |
| 15 | 21ETCCS027 | DEEPAK DHAKAR |
| 16 | 21ETCCS029 | DHIREN SUHALKA |
| 17 | 21ETCCS032 | DINESH AUDICHYA |
| 18 | 21ETCCS035 | DIVYANSHU SAHU |
| 19 | 21ETCCS036 | DURGA SANKAR DANGI |
| 20 | 21ETCCS037 | GAGAN MANGAL |
| 21 | 21ETCCS040 | GAZI AMAN KHAN |
| 22 | 21ETCCS042 | HARSH SONI |
| 23 | 21ETCCS043 | HARSHAL PALIWAL |
| 24 | 21ETCCS044 | HARSHIT PUROHIT |
| 25 | 21ETCCS046 | HARSHITA RATHORE |
| 26 | 21ETCCS047 | HEET DOSI |
| 27 | 21ETCCS050 | JAINIL JAIN |
| 28 | 21ETCCS051 | JASWANT SINGH RAO |
| 29 | 21ETCCS053 | JAY JOSHI |
| 30 | 21ETCCS057 | KAMLESH KUMAR GHANCHI |
| 31 | 21ETCCS059 | KASHVI PANDEY |
| 32 | 21ETCCS060 | KHUSHAL PALIWAL |
| 33 | 21ETCCS062 | KHUSHI VANAWAT |
| 34 | 21ETCCS065 | KUNAL MENARIA |
| 35 | 21ETCCS066 | KUNAL PALIWAL |
| 36 | 21ETCCS068 | KUNIKA KADECHA |
| 37 | 21ETCCS074 | MANSI GEHLOT |
| 38 | 21ETCCS076 | MAYANK MALIWAL |
| 39 | 21ETCCS078 | MITANSH JAIN |
| 40 | 21ETCCS079 | MOHAMMED OWAIS KHAN |  |  |  |
| 41 | 21ETCCS081 | NAVNEET ANAND |  |  |  |
| 42 | 21ETCCS082 | NEHAL DHING |  |  |  |
| 43 | 21ETCCS087 | PRANJAL SINGHVI |  |  |  |
| 44 | 21ETCCS088 | RAJAT PATIDAR |  |  |  |
| 45 | 21ETCCS090 | ROHIN GANG |  |  |  |
| 46 | 21ETCCS092 | SAHIL SOLANKI |  |  |  |
| 47 | 21ETCCS094 | SATYEN KHARADI |  |  |  |
| 48 | 21ETCCS096 | SHUBHAM DAS |  |  |  |
| 49 | 21ETCCS098 | SUMIT VASITA |  |  |  |
| 50 | 21ETCCS099 | SUYASH SONI |  |  |  |
| 51 | 21ETCCS101 | TUSHAR YADAV |  |  |  |
| 52 | 21ETCCS104 | VARUN SHARMA |  |  |  |
| 53 | 21ETCCS105 | VEDANSHI PAREEK |  |  |  |
| 54 | 21ETCCS108 | VIMANYU P SHARMA |  |  |  |
| 55 | 21ETCCS110 | VISHAL PUSHKARNA |  |  |  |
| 56 | 21ETCCS111 | VYOM BHATT |  |  |  |
| 57 | 21ETCCS115 | YOGESH JAIPAL |  |  |  |
| 58 | 21ETCCS116 | MS YUVIKA CHOUDHARY |  |  |  |
| 59 | 21ETCCS117 | YUVRAJ SINGH KANAWAT |  |  |  |
| 60 | 21ETCCS300 | NEELAM KATARIYA |  |  |  |
| 61 | 21ETCCS400 | SHABBIR HUSAIN |  |  |  |

**Signature of Faculty: Signature of HOD**

**Model Question Paper**

**TECHNO INDIA NJR INSTITUTE OF TECHNOLOGY, UDAIPUR**

**B. TECH 3rd – YEAR (VI SEM.)**

**Digital Image Processing (6CS3-01**)

**Time:** 2 Hr **Max. Marks:** 70

**Note:**

1. The paper is divided into 2 parts: Part-A, Part-B and Part-C.
2. Part-A contains 10 questions and carries 2 mark each.
3. Part-B contains 7 questions. Each question carries 4 marks each. Attempt any 5 Questions
4. Part-C contains 5 questions. Each question carries 10 marks each. Attempt any 3 Questions

Part- A (20 Marks)

|  |  |  |
| --- | --- | --- |
|  | Mention the name of different application of digital image processing. | CO1 |
|  | Define digital image. | CO1 |
|  | Explains linear intensity transformation. | CO2 |
|  | What is the value of central pixel if it is smoothened by 3\*3 mean filter: f(x,y)= 1 2 2 3 2 1 4 2 1 1 2 1 | CO2 |
|  | Define noise of the image. | CO3 |
|  | What do you mean by image restoration? | CO3 |
|  | Define inter pixel redundancy. | CO4 |
|  | Define the need of image compression. | CO4 |
|  | Define image segmentation. | CO5 |
|  | Define Line detection process. | CO5 |

**Part- B** (20 Marks)

|  |  |
| --- | --- |
| 1. Explain in detail image sampling and Quantization process in digital image storage. | CO1 |
| 2. Explain in detail color models in details mention below:* HSV
* YIQ
* XYZ
 | CO1 |

|  |  |
| --- | --- |
| 3. Explain frequency domain filter in detail in digital image processing. | CO2 |
|  4. Explain in detail different noise model in detail. | CO3 |

|  |  |
| --- | --- |
| 5. Explain in detail Homomorphism Filtering. Also derive the expression for its output. | CO3 |
| 1. Define Lossy compression techniques. Disadvantage of Lossy compression process. Describe in detail all types of Lossy compression techniques.
 | CO4 |

|  |  |
| --- | --- |
| 7. A. Define all types of thresholding in detail.B. Explain in detail edge detection process of image in detail. | CO5 |

**Part C** (30 Marks)

|  |  |
| --- | --- |
| 1. A. Explain in detail different stages of digital image processing

B. Explain in detail image acquisition process in digital image storage. | CO1 |
| 2. A. Compute the 2D DFT of 4\*4 given image:  f(x,y)= 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1B. a) Compute the histogram of output image obtained by enhancing the input histogram equalization techniques. What is the purpose of histogram equalization. | CO2 |
| 1. A. Explain in details different types of the noise in image.

B. Explain in detail Inverse Filtering. Also derive the expression for its output. | CO3 |
| 1. A. Find the Huffman coding for given seven letters along with probability of occurrence :

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Letters | B | A | G | D | E | C | F |
| Probability | 0.110 | 0.154 | 0.011 | 0.063 | 0.072 | 0.072 | 0.015 |

B. Encode **‘ace’** using Arithmetic coding

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Letters | a | b | c | d | e |
| Probability | 0.30 | 0.15 | 0.25 | 0.10 | 0.20 |

 | CO4 |
| 5. A. Explain in detail all types of Region Based Segmentation.B. Explain in detail Hough transforms for edge linking . | CO5 |

**RESULT ANALYSIS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **S.No.**  | **Roll. No.** | **Name** | **EXT** | **INT** | **Total** |
| 1 | 21ETCCS001 | AARSH BHARTI |   | 27 | 27 |
| 2 | 21ETCCS002 | MS AASTHA DAKHERA |   | 30 | 30 |
| 3 | 21ETCCS003 | ABHISHEK PRAJAPAT |   | 25 | 25 |
| 4 | 21ETCCS005 | AKSHANSH SONI |   | 26 | 26 |
| 5 | 21ETCCS006 | AKSHAT SINGH CHOUHAN |   | 28 | 28 |
| 6 | 21ETCCS007 | ANIRUDH SINGH RAJPUROHIT |   | 25 | 25 |
| 7 | 21ETCCS008 | ANISH SINGHAL |   | 28 | 28 |
| 8 | 21ETCCS009 | ANJALI SONI |   | 29 | 29 |
| 9 | 21ETCCS010 | ANURAG MENARIA |   | 27 | 27 |
| 10 | 21ETCCS011 | ANUSHKA VIJAY |   | 28 | 28 |
| 11 | 21ETCCS012 | APURVA LODHA |   | 30 | 30 |
| 12 | 21ETCCS013 | ARUN LOHAR |   | 28 | 28 |
| 13 | 21ETCCS014 | ARVIND SINGH |   | 25 | 25 |
| 14 | 21ETCCS015 | ARVIND SUTHAR |   | 26 | 26 |
| 15 | 21ETCCS016 | AVANI JOSHI |   | 26 | 26 |
| 16 | 21ETCCS017 | AYAN KHAN |   | 27 | 27 |
| 17 | 21ETCCS018 | AYUSH JHOTA |   | 29 | 29 |
| 18 | 21ETCCS019 | AYUSH TALESARA |   | 25 | 25 |
| 19 | 21ETCCS020 | BHAVYA MEHTA |   | 27 | 27 |
| 20 | 21ETCCS021 | BHERU SINGH PANWAR |   | 27 | 27 |
| 21 | 21ETCCS022 | MS BHUMIKA VARDAR |   | 28 | 28 |
| 22 | 21ETCCS025 | CHINMAY MENARIA |   | 27 | 27 |
| 23 | 21ETCCS026 | DAKSH VYAS |   | 26 | 26 |
| 24 | 21ETCCS027 | DEEPAK DHAKAR |   | 26 | 26 |
| 25 | 21ETCCS029 | DHIREN SUHALKA |   | 27 | 27 |
| 26 | 21ETCCS030 | DHRUV BAGORA |   | 28 | 28 |
| 27 | 21ETCCS031 | DIKSHA AGARWAL |   | 30 | 30 |
| 28 | 21ETCCS032 | DINESH AUDICHYA |   | 26 | 26 |
| 29 | 21ETCCS034 | DIVYANSHU MENARIA |   | 28 | 28 |
| 30 | 21ETCCS035 | DIVYANSHU SAHU |   | 26 | 26 |
| 31 | 21ETCCS036 | DURGA SANKAR DANGI |   | 26 | 26 |
| 32 | 21ETCCS037 | GAGAN MANGAL |   | 26 | 26 |
| 33 | 21ETCCS038 | GARVITA BAYA |   | 29 | 29 |
| 34 | 21ETCCS039 | GARVITA JAIN |   | 30 | 30 |
| 35 | 21ETCCS040 | GAZI AMAN KHAN |   | 26 | 26 |
| 36 | 21ETCCS041 | HARSH |   | 28 | 28 |
| 37 | 21ETCCS042 | HARSH SONI |   | 27 | 27 |
| 38 | 21ETCCS043 | HARSHAL PALIWAL |   | 27 | 27 |
| 39 | 21ETCCS044 | HARSHIT PUROHIT |   | 26 | 26 |
| 40 | 21ETCCS045 | HARSHIT SHARMA |   | 28 | 28 |
| 41 | 21ETCCS046 | HARSHITA RATHORE |   | 25 | 25 |
| 42 | 21ETCCS047 | HEET DOSI |   | 27 | 27 |
| 43 | 21ETCCS048 | MS HETAL SHARMA |   | 29 | 29 |
| 44 | 21ETCCS049 | JAHNAVI JOSHI |   | 30 | 30 |
| 45 | 21ETCCS050 | JAINIL JAIN |   | 27 | 27 |
| 46 | 21ETCCS051 | JASWANT SINGH RAO |   | 26 | 26 |
| 47 | 21ETCCS052 | JATIN VASHISHTHA |   | 29 | 29 |
| 48 | 21ETCCS053 | JAY JOSHI |   | 26 | 26 |
| 49 | 21ETCCS054 | JAYDEEP DANGI |   | 29 | 29 |
| 50 | 21ETCCS055 | JIGYASA CHATURVEDI |   | 28 | 28 |
| 51 | 21ETCCS056 | KAILASH JOSHI |   | 28 | 28 |
| 52 | 21ETCCS057 | KAMLESH KUMAR GHANCHI |   | 27 | 27 |
| 53 | 21ETCCS058 | KANISHKA PARMAR |   | 30 | 30 |
| 54 | 21ETCCS059 | KASHVI PANDEY |   | 27 | 27 |
| 55 | 21ETCCS060 | KHUSHAL PALIWAL |   | 25 | 25 |
| 56 | 21ETCCS061 | KHUSHI GAHLOT |   | 28 | 28 |
| 57 | 21ETCCS062 | KHUSHI VANAWAT |   | 26 | 26 |
| 58 | 21ETCCS064 | KUNAL CHOUBISA |   | 28 | 28 |
| 59 | 21ETCCS065 | KUNAL MENARIA |   | 27 | 27 |
| 60 | 21ETCCS066 | KUNAL PALIWAL |   | 25 | 25 |
| 61 | 21ETCCS067 | KUNAL SHARMA |   | 28 | 28 |
| 62 | 21ETCCS068 | KUNIKA KADECHA |   | 26 | 26 |
| 63 | 21ETCCS069 | LALITA DANGI |   | 30 | 30 |
| 64 | 21ETCCS070 | LAVISHA JAIN |   | 29 | 29 |
| 65 | 21ETCCS071 | LOKANTIK JAIN |   | 29 | 29 |
| 66 | 21ETCCS073 | MAHAK BANSAL |   | 28 | 28 |
| 67 | 21ETCCS074 | MANSI GEHLOT |   | 26 | 26 |
| 68 | 21ETCCS075 | MAYANK KANERIYA |   | 29 | 29 |
| 69 | 21ETCCS076 | MAYANK MALIWAL |   | 27 | 27 |
| 70 | 21ETCCS078 | MITANSH JAIN |   | 25 | 25 |
| 71 | 21ETCCS079 | MOHAMMED OWAIS KHAN |   | 27 | 27 |
| 72 | 21ETCCS081 | NAVNEET ANAND |   | 27 | 27 |
| 73 | 21ETCCS082 | NEHAL DHING |   | 27 | 27 |
| 74 | 21ETCCS084 | NIPUN MALI |   | 28 | 28 |
| 75 | 21ETCCS085 | NISHA LOHAR |   | 30 | 30 |
| 76 | 21ETCCS086 | PRADHUMAN SINGH CHAUDHARY |   | 28 | 28 |
| 77 | 21ETCCS087 | PRANJAL SINGHVI |   | 27 | 27 |
| 78 | 21ETCCS088 | RAJAT PATIDAR |   | 25 | 25 |
| 79 | 21ETCCS089 | RIYA JAIN |   | 30 | 30 |
| 80 | 21ETCCS090 | ROHIN GANG |   | 25 | 25 |
| 81 | 21ETCCS091 | RUPAL SONI |   | 29 | 29 |
| 82 | 21ETCCS092 | SAHIL SOLANKI |   | 27 | 27 |
| 83 | 21ETCCS093 | SARGAM JAIN |   | 29 | 29 |
| 84 | 21ETCCS094 | SATYEN KHARADI |   | 26 | 26 |
| 85 | 21ETCCS095 | SHASHANK MENARIA |   | 28 | 28 |
| 86 | 21ETCCS096 | SHUBHAM DAS |   | 25 | 25 |
| 87 | 21ETCCS097 | SUDEEP ROY |   | 29 | 29 |
| 88 | 21ETCCS098 | SUMIT VASITA |   | 25 | 25 |
| 89 | 21ETCCS099 | SUYASH SONI |   | 25 | 25 |
| 90 | 21ETCCS100 | MS TANISHA KUMAWAT |   | 28 | 28 |
| 91 | 21ETCCS101 | TUSHAR YADAV |   | 25 | 25 |
| 92 | 21ETCCS102 | VAIBHAV GARG |   | 29 | 29 |
| 93 | 21ETCCS103 | VAIBHAV SONI |   | 30 | 30 |
| 94 | 21ETCCS104 | VARUN SHARMA |   | 25 | 25 |
| 95 | 21ETCCS105 | VEDANSHI PAREEK |   | 25 | 25 |
| 96 | 21ETCCS106 | VEDAS DIXIT |   | 29 | 29 |
| 97 | 21ETCCS107 | VIKRAM SINGH SISODIYA |   | 28 | 28 |
| 98 | 21ETCCS108 | VIMANYU P SHARMA |   | 26 | 26 |
| 99 | 21ETCCS109 | VISHAL KUMAWAT |   | 28 | 28 |
| 100 | 21ETCCS110 | VISHAL PUSHKARNA |   | 26 | 26 |
| 101 | 21ETCCS111 | VYOM BHATT |   | 27 | 27 |
| 102 | 21ETCCS112 | YASH JAIN |   | 28 | 28 |
| 103 | 21ETCCS113 | YASH JOSHI |   | 28 | 28 |
| 104 | 21ETCCS114 | YASH PURI GOSWAMI |   | 28 | 28 |
| 105 | 21ETCCS115 | YOGESH JAIPAL |   | 25 | 25 |
| 106 | 21ETCCS116 | MS YUVIKA CHOUDHARY |   | 26 | 26 |
| 107 | 21ETCCS117 | YUVRAJ SINGH KANAWAT |   | 27 | 27 |
| 108 | 21ETCCS300 | NEELAM KATARIYA |   | 27 | 27 |
| 109 | 21ETCCS400 | SHABBIR HUSAIN |   | 25 | 25 |
| 110 | 21ETCCS401 | ALI HUSSAIN |   | 28 | 28 |
| 111 | 22ETCCS200 | SAURABH SONI |   | 29 | 29 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| TOTAL | PASS | FAIL | ABSENT | PASS % |
| 111 | Result Awaited  | Result Awaited | Result Awaited | Result Awaited |

**Indirect Assessment:**

**Overall Teacher Self Assessment (at the completion of course) in terms of course objective and outcomes**

**Course Objectives:**

Student will be able to list fundamental principles of digital image processing, including color image processing, intensity transformation.

Student will be able to apply filtering operation to restore the degraded image, Segmentation and thresholding operation.

Student will be able to apply image compression algorithm.

**Course Outcomes**:

Students can apply the fundamental principles of digital image processing, including color image processing, intensity transformation.

Students can apply filtering operation to restore the degraded image, Segmentation and thresholding operation.

Students can apply image compression algorithm.

**Methodology to identify bright student**

Considered a range of criteria, including academic performance, creativity, critical thinking, problem-solving skills, and enthusiasm for learning. Bright students often excel in multiple areas. Observed how students perform in the classroom. In terms of active participation, engagement in discussions, leadership, and the ability to grasp complex concepts.

**Efforts to keep students engaged**

1. Active Learning:
	* Incorporate active learning strategies, such as group discussions, problem-solving activities, and hands-on projects. Active participation keeps students engaged and encourages critical thinking.
2. Varied Teaching Methods:
	* Use a variety of teaching methods, including lectures, group work, multimedia presentations, and interactive activities to cater to different learning preferences.
3. Technology Integration:
	* Leverage technology, such as online platforms, educational apps, and interactive software, to make lessons more engaging and interactive.

 Some extra learning for bright students

1. <https://www.coursera.org/specializations/image-processing>
2. <https://www.coursera.org/learn/introduction-computer-vision-watson-opencv>
3. <https://www.mygreatlearning.com/academy/learn-for-free/courses/digital-image-processing>

https://www.mygreatlearning.com/academy/learn-for-free/courses/digital-image-processing

**Methodology to identify weakstudent**

Considered a range of criteria, including classroom observation, formative assessment, summative assessment, assignment review e.t.c. Weak students are struggling students with sensitivity and a desire to support their learning. Some measures, such as additional tutoring, personalized assignments, or alternative assessment methods, to help students succeed.

**Targeted inventions for weak student**

**1. Additional Resources**

Offer supplementary learning materials, such as textbooks, online resources, or multimedia content, to provide alternative explanations and reinforce key concepts.

**2. Remedial classes**

Establish a tutoring program where students can receive extra help from teachers.

**3. Flipped classroom**

Students are assigned pre-class learning materials, often in the form of videos, readings, or online modules, to cover the foundational concepts before coming to class.

Some additional resources or links for student to improve their understanding for topic

1. <https://www.geeksforgeeks.org/digital-image-processing-basics/>
2. <https://alison.com/course/fundamentals-of-digital-image-processing>
3. <https://www.simplilearn.com/image-processing-article>