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**Question Paper Code:U7B02**

B.E./B.Tech. DEGREE EXAMINATION, NOV 2025

Seventh Semester

21UBM702- MEDICAL IMAGE PROCESSING

Biomedical Engineering

(Regulations 2021)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

1. Compute the distance between the two pixels  $q(1,1)$   $p(2,2)$  using the city block distance measurement. CO2- App
2. Analyze the progression of the Mach band effect in an image with varying intensity levels, using a step-by-step diagram to illustrate its manifestation CO3-Ana
3. Sketch a block diagram for homomorphic filtering, highlighting its key components. CO1-U
4. Define Image Enhancement. CO1-U
5. Write down the mathematical formula for Salt and pepper noise. CO1-U
6. Define Rayleigh noise. CO1-U
7. Classify the types of discontinuity in digital image. CO1-U
8. Define region growing. CO1-U
9. Illustrate the need for Compression. CO1-U
10. Define run length coding. CO1-U

PART – B (5 x 16= 80 Marks)

11. (a) (i) Explain Discrete Fourier Transform (DFT) of an image in detail. CO1- U (16)  
(ii) Explain Discrete Cosine Transform of an image in detail.  
Or  
(b) Sketch and illustrate the elements of visual perception and also describe image formation in the eye. CO1- U (16)

12. (a) Analyze various point processing techniques for enhancing the visibility of faint structures in astronomical images, examining how each technique influences image detail and contrast. CO4 - Ana (16)
- Or
- (b) Analyze the design principles and operational differences of image sharpening and smoothing filters in the spatial domain, discussing their effects on image quality. CO4 - Ana (16)
13. (a) Analyze the statistical properties of mean filters, including their ability to reduce different types of noise (e.g., Gaussian, salt-and-pepper) and their impact on image features and texture. Compare and contrast these properties with other noise reduction techniques. CO4 - Ana (16)
- Or
- (b) Analyze how advancements in inverse filtering have influenced applications in medical diagnostics, forensics, and remote sensing, discussing the associated benefits as well as potential risks. CO4 - Ana (16)
14. (a) Perform the image negative for an given image using Point operation. CO3 - App (16)
- |   |   |   |   |
|---|---|---|---|
| 4 | 3 | 5 | 2 |
| 3 | 6 | 4 | 6 |
| 2 | 2 | 6 | 5 |
| 7 | 6 | 4 | 1 |
- Or
- (b) For a  $3 \times 3$  region of an image, the pixel intensities are: Compute the geometric mean of this window. CO3 - App (16)
- |   |   |   |
|---|---|---|
| 4 | 8 | 2 |
| 1 | 5 | 9 |
| 3 | 6 | 2 |
15. (a) Explain the fundamental principles of image compression. Differentiate between lossless and lossy compression techniques, focusing on their applications and trade-offs. CO1 - U (16)
- Or
- (b) Write short notes on the following in detail, CO1 - U (16)
- i . Medical Image Compression
  - ii .Mammogram Techniques.