

GANPAT UNIVERSITY**B. TECH. SEMESTER: VIII BIOMEDICAL & INSTRUMENTATION ENGINEERING****REGULAR EXAMINATION APRIL – JUNE 2017****2BM801: BIOLOGICAL DIGITAL IMAGE PROCESSING****Time: 3 Hours****Total Marks: 70**

- Instruction:** 1. This Question paper has two sections. Attempt each section in separate answer book.
 2. Figures on right indicate marks.
 3. Be precise and to the point in answering the descriptive questions.

SECTION - I**Q.1 (12)**

- a) What do you mean by image compression? Explain the fundamental of image compression in terms of R_D and C_R for data set n_1 and n_2 for condition $n_1 = n_2$, $n_1 \ll n_2$ and $n_1 \gg n_2$. **06**
- b) Why it is common practice to multiply the input image function $f(x,y)$ by $(-1)^{x+y}$ prior to compute the FT? With diagram explain the various stages of filtering in the frequency domain. **06**

OR**Q.1 (12)**

- a) What do you mean by ideal LPF? Explain ideal LPF with necessary formula and diagram. Give the effect of increasing cutoff distance (radius) on ideal LPF output. **06**
- b) Elaborate the concept behind the Psychovisual redundancy for image data compression. Write steps for IGS code generation and give example for same to generate new codes. **06**

Q.2 (11)

- a) Explain the Huffman coding and explain the coding decoding of following data set and calculate the L_{avg} . **06**

| Symbol | A1 | A2 | A3 | A4 | A5 | A6 |
|-------------|-----|-----|------|-----|------|-----|
| Probability | 0.1 | 0.4 | 0.06 | 0.1 | 0.04 | 0.3 |

- b) Enlist the types of frequency domain smoothing filters. Give the clear comparison between Ideal, Butterworth and Gaussian LPF. **05**

OR**Q.2 (11)**

- a) Explain the laplacian in frequency domain. **06**
- b) Explain the Interpixel redundancy with new code generation to remove Interpixel redundancy. **05**

Q.3 (12)

- a) How analog image converted into digital image? Explain the representation of digital image. **03**
- b) Explain all the digital image property. **03**
- c) What are cones and rods? Give the reason why the cones can resolve the fine detailed in image and rods give overall vision of field of view? **03**
- d) What is spatial domain and frequency domain image enhancement? **03**

SECTION-II

- Q.4 (12)
- a) How image enhancement is different from image restoration. Describe any three point processing techniques that can be used for image enhancement. 6
- b) What is histogram? State its significance. Enlist and compare techniques used for processing of histogram. Prove that CDF will give uniform distribution of "S" by equations. 6

OR

- Q.4 (12)
- a) Briefly explain the process of neighborhood operation in spatial domain. How pixels at the edges are handled? 3
- b) Enlist linear spatial filters. Explain any one technique with example. Explain the high pass and high boost image sharpening filters of spatial domain. 6
- c) Write about arithmetic and logic operations that can be performed on images. 3

- Q.5 (11)
- a) State the principal approach of image segmentation. Describe global thresholding technique and differentiate it from local and adaptive thresholding techniques. 4
- b) Write about point and line detection masks used for edge detection. 4
- c) What is need of segmentation? Describe region splitting and merging algorithm. 3

OR

- Q.5 (11)
- a) Define saturation and hue. Explain different types of color models that can be used in image processing. 4
- b) Explain any two techniques that can be used for color transformation in image processing. 3
- c) Write equations and explain briefly following morphological tools: 4
- 1) Region filling 2) Top hat and black hat transformation 3) Thickening

- Q.6 (12)
- a) State and draw different noise models responsible for image degradation. Explain different mean filters used to remove noise in order to restore image. 6
- b) Define structure element. Discuss dilation and erosion operation with example. 4
- c) Write brief note on types of edge models. 2

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