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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belgaum)

Second Semester, M. Tech - Computer Engineering (MCEN)

Semester End Examination; June - 2016

Digital Image Processing

Time: 3 hrs

Max. Marks: 100

Note: Answer FIVE full questions, selecting ONE full question from each unit.

UNIT - I

- 1 a. Define Image. Explain the components of digital image processing with a neat diagram. 10
- b. Write the uses of imaging based on :
 - i) Visible and infrared bands 10
 - ii) Gamma Ray Imaging
 - iii) X-Ray imaging.
- 2 a. Write the steps involved in converting analog to digital image with an example. 10
- b. Let I be an image of size 256 x 128 in which each pixel is represented by 1024 different levels. Compute the memory requirement of this image in terms of bytes. 5
- c. Illustrate the Movie pattern effect with the steps involved in attaining the same. 5

UNIT - II

- 3 a. What is the principal advantage and disadvantage of piecewise-linear transformation functions? Explain contrast stretching and Gray-level slicing. 10
- b. What is a histogram? Illustrate the concept of histogram equalization highlighting its advantages with necessary diagrams. 10
- 4 a. What is filtering? Explain the steps of filtering in the frequency domain with a neat block diagram. 10
- b. Which are the basic smoothing frequency domain filters? Correlate frequency domain filtering to spatial domain filtering. 10

UNIT - III

- 5 a. Illustrate restoration in the presence of noise with the aid of :

i) Arithmetic mean filter	ii) Geometric mean filter	
iii) Harmonic mean filter	iv) Median filter	v) Midpoint filter.
- b. Explain Inverse and Wiener filtering. 10
- 6 a. Explain the HSI color model. Give the formula for converting colors from HSI to RGB. 10
- b. Explain :
 - i) Color slicing 10
 - ii) Tone and color corrections.

Contd...2

UNIT - IV

7 a. What is data compression? Explain three data redundancies used in image compression with necessary equations. 10

b. i) Compute the entropy of the given 8-bit image segment :

21	21	21	95	169	243	243	243
21	21	21	95	169	243	243	243
21	21	21	95	169	243	243	243
21	21	21	95	169	243	243	243

ii) A 4 x 4 image array and its corresponding reconstructed image array obtained through lossy compression scheme are given below:

148	129	133	89
153	138	103	84
155	141	92	78
162	139	86	81

Original

146	130	133	85
155	139	105	84
154	142	98	80
162	139	84	78

Reconstructed

10

Calculate the :

i) MSE ii) SNR.

8 a. Which are the two primitive operations of morphological processing? Explain them in detail. 10

b. When do we make use of morphological algorithms? Write in detail about the methods :

i) Region filling ii) Thinning

iii) Thickening iv) Pruning

10

Used as pre and post-processing steps in conjunction with morphological algorithms.

UNIT - V

9 a. Explain global processing via the Hough transform. 10

b. Explain the use of motion in segmentation. 10

10a. Explain decision-theoretic methods for pattern recognition. 10

b. Write in detail about any two structural methods for pattern recognition. 10

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