



# MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL  
(A constituent unit of MAHE, Manipal)

## SEVENTH SEMESTER B.TECH. (INSTRUMENTATION AND CONTROL ENGG.) END SEMESTER DEGREE EXAMINATIONS, DECEMBER - 2020

**SUBJECT: Digital Image Processing [ICE 4021]**

**26-12-2020**

TIME: 3 HOURS

MAX. MARKS: 50

**Instructions to candidates :** *Answer ALL questions and missing data may be suitably assumed.*

- 1A. With a simplified diagram explain the process of formation of image in human eye.  
 1B. With an example for each, explain any four fundamental steps of digital image processing.  
 1C. Mention and explain any two fields that uses digital image processing.  
 (4+4+2)
- 2A. Describe the following with an example,  
     i) Isopreference curves   ii) m-adjacency  
 2B. Show that the operator  $S$  that computes the median of a sub-image area is nonlinear.  
 2C. For a given  $4 \times 4$  image, perform the histogram equalization and plot histogram of an image before and after equalization.
- |   |   |   |   |
|---|---|---|---|
| 2 | 4 | 2 | 3 |
| 4 | 2 | 1 | 6 |
| 4 | 6 | 4 | 3 |
| 6 | 2 | 4 | 3 |
- (3+2+5)
- 3A. Discuss about Gaussian and the Salt-and-Pepper noise with its PDF.  
 3B. Explain the following with relevant graphs,  
     i) Power-law transformation   ii) Histogram specification.  
 3C. Explain and compare Gaussian and Butterworth lowpass filters.  
 (2+3+5)

4A. Compute the entropy of given 8-bit image,

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

4B. Explain three principal types of data redundancies, with an example for each.

4C. For the given probability distribution of source symbols, determine the following

i) Huffman coding ii) Average length of generated code

S0	S1	S2	S3	S4
0.55	0.15	0.15	0.10	0.05

(2+3+5)

5A. How to locate the region of interest using thresholding technique? Explain.

5B. With various kernel structure, explain edge detection technique.

5C. Mention any two applications of CAD tool. Describe the steps of analysing medical images using feature extraction technique.

(2+3+5)

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