

MASTER OF SCIENCE (COMPUTER SCIENCE) (CBCS-2018 COURSE)
M.Sc. (Computer Science) Sem-I : WINTER- 2022
SUBJECT : DIGITAL IMAGE PROCESSING

Day : Wednesday

Time : 02:00 PM-05:00 PM

Date : 11/1/2023

W-20039-2022

Max. Marks : 60

N.B.

- 1) All questions are **COMPULSORY**.
 - 2) Figures to the right indicate **FULL** marks.
 - 3) Draw diagrams **WHEREVER** necessary.
 - 4) Use of calculator is **ALLOWED**.
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- Q.1**
- a) Explain the fundamental steps in digital image processing with the help of block diagram. **(08)**
 - b) State the equations for 2-D discrete Fourier transform and its inverse. Explain any two properties of 2-D discrete Fourier transform. **(07)**

OR

- a) Explain in detail the steps for filtering in the frequency domain. **(08)**
- b) Explain image acquisition using sensor strips with necessary diagrams. **(07)**

- Q.2** A) Attempt any **ONE** of the following: **(08)**

- a) Given a 3-bit image of size 64 x 64 pixels having intensity distributions as shown in the table given below, where intensity levels are in the range 0-7. Apply histogram equalization technique and find the transfer function $T(r)$ which relates input image intensity level r_k to output image intensity level S_k .

Intensity level	Number of pixels
$r_0 = 0$	790
$r_1 = 1$	1023
$r_2 = 2$	850
$r_3 = 3$	656
$r_4 = 4$	329
$r_5 = 5$	245
$r_6 = 6$	122
$r_7 = 7$	81

- b) Explain the morphological operations “opening” and “closing” with suitable diagrams.

- B)** Attempt any **ONE** of the following: **(07)**

- a) Explain the different ways of estimating degradation function.
- b) Explain the role of sampling and quantization in forming a digital image.

P.T.O.

Q.3 Attempt any **THREE** of the following: **(15)**

- a) Given below is “x” : a section of horizontal intensity profile from an image. Illustrate the 1st and 2nd derivative of the 1-D digital function represented by “x”. Depict zero crossing if any.

x=

5	5	5	5	5	2	2	2	2	2	2	3	4	5	5	5	6	6	6	6
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- b) Define “erosion”. Explain it with suitable diagram.
- c) One dimensional image strip represented by {1 2 5 9 4 3} is to be convolved with a filter kernel given by {-1 0 1}. Give the step by step procedure of finding the answer.
- d) Explain the Gamma Correction in detail.
- e) Define Euclidean distance and city-block distance between pixels p(x,y) and q(s,t).

Q.4 Write short notes on any **THREE** of the following: **(15)**

- a) Ideal high pass filter
- b) Homomorphic filtering
- c) Intensity thresholding
- d) Region based segmentation
- e) Chain codes

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