STUDENT EXAM NUMBER:

GANPAT UNIVERSITY
B.TECH SEM. VII MECHATRONICS ENGINEERING
REGULAR EXAMINATION DEC-2012
MC-705 DIGITAL IMAGE PROCESSING AND MACHINE VISION

TIME: 3 HOURS **TOTAL MARKS: 70**

Instructions:
1) Attempt all questions.
2) Assume suitable data wherever necessary.

SECTION-I

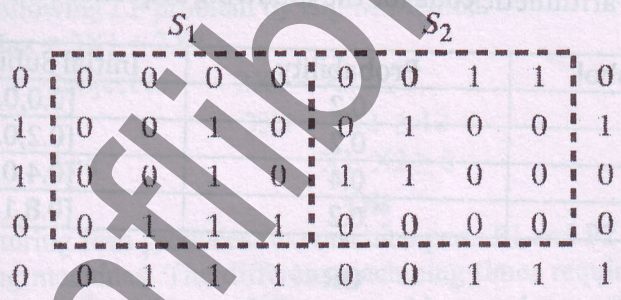
Q.1. Attempt all. (12)

A) Explain the importance of Perspective Transformation with example.
B) Explain the Microdensitometer with neat sketch.
C) Explain the adjacency, connectivity and neighbourhood between pixels with example.

OR

Q.1. Attempt all. (12)

A) Explain the Machine Vision System as a case study.
B) Explain Camera Calibration procedure.
C) Consider the two image subsets, $S1$ and $S2$, shown in the following figure. For V= {1}, determine whether these two subsets are (a) 4-connected, (b) 8-connected, or (c) m-connected.



Q.2. Attempt all. (11)

A) Describe the Fundamental steps in Digital Image Processing with a theme example of mail card reading.
B) In a Camera system, the camera is mounted on a gimbal system enables the camera to pan and tilt. The gimbal center is at point (3, 3, 3). The tilt angle is 45° and the pan angle is 60°. The camera center is displaced from the gimbal center by (0.5, 0.3,0.2). Find out the homogeneous camera co-ordinates of a world point (5, 7, 9). Assume that the distance between the lens center and origin of the coordinate system is 3cm.

OR

Q.2. Attempt all. (11)

A) Explain with neat sketch the Camera model.
B) Describe the construction & working of a Vidicon tube with a sketch.

Q.3. Attempt any three. (12)

A) Describe the importance of segmentation in machine vision.

B) Write a short note on Region based segmentation.

C) Write a MATLAB script to plot a filled circle of 5m radius & view in 3-D.

D) Explain the stereo imaging.

SECTION-II

Q.4. Attempt all. (12)

A) Explain the mechanics of filtering. What is need of filters in image processing?

B) Elaborate the statement: "Laplacian filters are rotation invariant filters".

C) Define Derivative filter? Explain the Laplacian in Frequency Domain.

OR

Q.4. Attempt all. (12)

A) What is Piecewise Linear Transformation? And explain any one of it.

B) What is an isotropic filter? Explain how to generate an average and median filter mask.

C) Write the steps involved in frequency domain filtering. Explain the Laplacian filter.

Q.5. Attempt all. (11)

A) What is the role of encoder and decoder in image compression?

B) Calculate the arithmetic code for the following sequence ABBCCD :

Source Symbol	Probability	Initial Subinterval
A	0.2	[0.0,0.2)
B	0.2	[0.2,0.4)
C	0.4	[0.4,0.8)
D	0.2	[0.8,1.0)

OR

Q.5. Attempt all. (11)

A) What is the need for image compression? & explain types of data redundancy in image compression in detail.

B) Explain the Huffman coding with one example.

Q.6. Attempt any three. (12)

A) Develop a method to generate a high boost filter. Differentiate linear spatial filter and non-linear spatial filter.

B) Specify the properties of 2D Discrete Fourier transform and explain any one of them.

C) Explain LZW coding with an appropriate example.

D) Write a MATLAB program to illustrate the Bit plane slicing of an image.

END OF PAPER