

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST-2 EXAMINATION-OCTOBER-2023

Ph. D - I Semester

COURSE CODE (CREDITS): 21M1WEC232 (3)

MAX. MARKS: 25

COURSE NAME: Medical Image Processing and Applications

COURSE INSTRUCTOR: Dr. Pardeep Garg

MAX. TIME: 1.5 Hours

*Note: (a) All questions are compulsory. (b) Marks are indicated against each question in square brackets. (c) The candidate is allowed to make suitable numeric assumptions wherever required for solving problems.*

**Q1.** Consider the image segment shown in figure 1. Let  $V = \{0, 1\}$ , compute the lengths of the shortest 4-, 8-, and m-path between  $p$  and  $q$ . If a particular path does not exist between these two points, explain why.

2 1 3 1 (q)  
4 3 0 3  
1 4 1 1  
(p) 1 0 1 3

Figure 1

[CO-1, 5 marks]

**Q2(i).** What is the important characteristic of logarithmic transformation? Explain in detail with an application. [CO-1, 2 marks]

**Q2(ii).** Define histogram of a digital image. How will the histogram of various contrast's images like dark image, bright image, low contrast image and high contrast image be distributed? [CO-1, 1+2=3 marks]

**Q2(iii).** How do histogram equalization and histogram matching techniques work? [CO-1, 2 marks]

**Q3.** The median of a set of numbers is such that half the values in the set are below median and the other half are above it. For example, the median of the set of values {3, 6, 15, 24, 29, 31 and 35} is 24. Show that an operator that computes the median of a subimage area,  $S$ , is nonlinear. [CO-1, 3 marks]

**Q4.** Why is edge detection required in Image processing? Discuss the principle of operation of Sobel, Prewitt, Canny, and Laplacian edge detectors. [CO-1, 1+4=5 marks]

**Q5.** Discuss the basic objective behind image segmentation. Discuss the concept of region splitting and merging to achieve the image segmentation. [CO-1, 1+4=5 marks]