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(2)

Image X

0	0	0	0	0	0	0
0	1	0	1	1	0	0
0	1	1	1	1	1	0
0	0	1	1	1	1	0
0	1	0	1	1	0	0
0	0	0	0	1	0	0
0	0	0	0	0	0	0

Structuring Element Y

0	1	0
1	1	1
0	1	0

Conventional Neural Network

Neural Network

0	1	1
1	1	1
0	1	1

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Roll No. ....

**TCS-548**

**B. TECH. (CSE) (FIFTH SEMESTER)**

**END SEMESTER**

**EXAMINATION, Dec., 2023**

**COMPUTER VISION**

**Time : Three Hours**

**Maximum Marks : 100**

**Note :** (i) All questions are compulsory.

(ii) Answer any *two* sub-questions among (a), (b) and (c) in each main question.

(iii) Total marks in each main question are **twenty**.

(iv) Each sub-question carries 10 marks.

- (a) Write different steps which are automated by Computer Vision. Explain the working of Computer Vision. (CO1)

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- (b) Explain Hough Transform. What are the possible applications where it can be used ? Justify your selection of applications. (CO1)
- (c) What are the major open problems in computer vision ? Explain in detail. (CO1)
2. (a) What is feature extraction in image processing, and why is this technique important in computer vision ? Provide an example of an application of feature extraction in computer vision. (CO2)
- (b) Explain the functioning of graph cut approach for image segmentation. (CO2)
- (c) Suppose you want to make your village/town smart by using computer vision techniques. What are different applications where you will deploy vision-based framework. (CO2)
3. (a) Explain the following operations : (CO3)
- (i) Contrast stretching
- (ii) Bit-plane slicing

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- (b) Perform region splitting and merging by taking suitable example. (CO3)
- (c) Why we require histogram equalization. Explain histogram equalization by taking suitable example. (CO3)
4. (a) Why coding system required for image compression ? Explain by calculating the average code length for the Huffman code for below image matrix : (CO4)

1	1	0	4	0
0	0	0	1	2
1	2	1	1	3
4	0	2	0	3
0	4	0	1	0

- (b) Compare Mean and median filters, in terms of their effectiveness for achieving image smoothness. Provide an explanation and demonstrate the potential differences by considering 7×7 image matrix. (CO4)
- (c) Describe application of Motion analysis using vision-based frameworks. How MHI can be used for encoding motion information. (CO4)

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5. (a) Histogram of a 3 bit image is shown in the following table : (CO5)

Gray Level	Number of pixels
0	1
1	5
2	4
3	4
4	4
5	3
6	2
7	2

Find optimal threshold using Otsu.

- (b) Describe the architecture of a typical Convolutional Neural Network (CNN). Discuss which layer is responsible for dimensionality reduction particularly in CNN ? Justify your answer with a suitable example. (CO5)
- (c) Perform Dilation on image X using structuring element Y. On resultant image (X') perform erosion using structuring element Z. X, Y and Z are as follows : (CO5)

Image X

0	0	0	0	0	0	0
0	0	1	1	0	1	0
0	1	1	1	1	1	0
0	1	1	1	1	0	0
0	0	1	1	0	1	0
0	0	1	0	0	0	0
0	0	0	0	0	0	0

Structuring Element Y

0	1	0
1	1	1
0	1	0

Structuring Element Z

1	1	0
1	1	1
0	1	1