

2023

**COMPUTER SCIENCE — HONOURS**

**Paper : DSE-A-1 and DSE-A-2**

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable.*

**Paper : DSE-A-1**

**(Digital Image Processing)**

**Full Marks : 50**

Answer *question no. 1* and *any four* questions from the rest.

2×5

1. Answer *any five* questions :

- Find the Euclidean distance between two pixels P(134, 145) and Q(20, 112).
- What do you understand by image filtering?
- Mention the purpose of image interpolation.
- What is the role of the Fourier transformation in image processing?
- What is Gamma correction?
- Mention the challenges of image compression.
- Write down the role of the Sobel operator in edge detection.
- How is image contrast affected by dynamic range of the imaging device?

- Explain histogram equalization. Why do we need to perform it on an image?
  - Differentiate between histogram equalization and histogram stretching.
  - Perform histogram stretching on an image given below with 8 intensity levels :

Gray level	0	1	2	3	4	5	6	7
No. of pixels	0	4	4	1	2	2	3	0

(2+2)+2+4

- Explain different global thresholding methods. 5+5
  - Write a heuristic algorithm to find the value of threshold.
- Discuss the following terms with proper diagrams : neighbours of a pixel, distance measures, path, connected component. 4+4+2
  - Explain sampling, quantization, image subtraction and image averaging.
  - Differentiate between uniform and non-uniform sampling.

**Please Turn Over**

5. (a) Mention the criteria for region-based segmentation.  
(b) Explain region splitting and merging with an example. 2+(4+4)
6. (a) Write down the purpose of edge detection.  
(b) Differentiate between thresholding and edge detection.  
(c) Why is noise reduction important in image processing?  
(d) Why is Sobel edge detection preferred over Prewitt edge detection? 2+2+3+3
7. (a) Discuss point processing methods to enhance an image.  
(b) Discuss mean filter and median filter using the following image.

0	5	4
7	20	5
4	3	7

5+5

8. (a) Explain the process of intensity level slicing with and without background.  
(b) Differentiate between box filter and weighted mean filter.  
(c) Explain how power law transformation function can be used to increase and decrease contrast of an image. 4+2+4

**Paper : DSE-A-2**  
**(Data Mining and Its Application)**  
**Full Marks : 50**

Answer *question no. 1* and *any four* questions from the rest.

1. Answer *any five* questions :

- (a) What do you mean by multi-class classification? 2×5
- (b) What is binning?
- (c) Define prediction.
- (d) Why is the training set generally made larger than the test set?
- (e) What is the need of data integration?
- (f) Name the two classification techniques used in data mining.
- (g) What is data Auditing tool?
- (h) What is the difference between text mining and web mining?

2. (a) Differentiate between Supervised Learning and Unsupervised Learning.

(b) Describe classification as two-step process. 5+5

3. (a) What is a data warehouse? Explain the difference between a Standard database and a Data warehouse.

(b) Explain the importance of strategic information in the context of data warehousing. (2+2)+6

4. (a) Discuss the K-NN Rule for classification with a suitable example. 6+4

(b) What do you mean by over-fitting and under-fitting?

5. (a) What do you mean by feature selection? Explain its importance in data mining. (2+3)+5

(b) Explain the need of dividing the dataset into a training set and a test set.

6. (a) What is the difference between knowledge discovery and data mining? 3+7

(b) Explain how Bayesian Classification helps in prediction.

7. (a) What do you mean by decision tree?

(b) Distinguish between parametric and non-parametric learning. 1+3+6

(c) Explain hierarchial and non-hierarchial clustering with suitable example.

**Please Turn Over**

8. Write short notes on *any two* :

5×2

- (a) Linear Regression
  - (b) Text mining
  - (c) Validation of Dataset
  - (d) Discriminant Analysis.
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