



বিদ্যাসাগর বিশ্ববিদ্যালয়
VIDYASAGAR UNIVERSITY

Question Paper

B.Sc. Honours Examination 2022

(Under CBCS Pattern)

Semester - VI

Subject: COMPUTER SCIENCE

Paper: DSE 3 - T

Full Marks : 40

Time : 2 Hours

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

The figures in the margin indicate full marks.

DIGITAL IMAGE PROCESSING

Group - A

Answer any **four** questions out of 6 questions carrying 5 marks of each. $5 \times 4 = 20$

1. Describe histogram equalization. Obtain histogram equalization for the following image segment of size 5 X 5.

20 20 20 18 16

15 15 16 18 15

15 15 19 15 17

16 17 19 18 16

20 18 17 20 15 (5 X 5) matrix

2. Classify the color space and describe the CMY color model.
3. Explain the term Feature extraction in the context of Image processing.
4. Explain the process of Dilation and Erosion, with the help of suitable example.
5. Explain the basis of filtering in Spatial domain and Frequency domain.
6. Explain the process of Image Segmentation using Region Growing, Region Splitting and Region Merging.

Group - B

Answer any *two* questions out of 4 questions carrying 10 marks of each. $10 \times 2 = 20$

7. What is thresholding ? What is the role of thresholding in image processing ? List the different types of thresholding.
 8. Explain the components of an image processing system, with the help of a suitable diagram.
 9. Differentiate between Low-pass filter and High-pass filter with suitable example.
 10. What do you mean by Image Restoration ? Discuss the minimum Mean-Square Error approach of Restoration.
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OR

INTRODUCTION TO DATA SCIENCE

Group - A

Answer any *four* questions.

5×4=20

1. What is the feature selection methods used to select the right variables ? 5
2. Why the data is so important in data science ? What do you mean by pre-processing ? 2+3
3. Differentiate between univariate, bivariate, and multivariate analysis.
4. What do you mean by Data Science ?
5. What are the basic data cleaning steps ?
6. How is Data modeling different from Database design ?

Group - B

Answer any *two* questions.

10×2=20

7. You are given a dataset on cancer detection. You have built a classification model and achieved an accuracy of 97 per cent. Why shouldn't you be happy with your model performance ? What can you do about it ? 3+7
 8. Explain the life cycle of data science ? Explain about data import in R Language ? 5+5
 9. What are the different pre-processing method used for different types of data. 10
 10. Explain different data import technique in R. 10
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OR**NUMERICAL METHODS****Group - A**Answer any *four* questions.

5×4=20

1. (a) What do you mean by interpolating polynomial ?
(b) Round the number 2.2514 to three significant figures and find the absolute error, relative error. 2+3
2. Establish the condition of convergence of Newton-Raphson Method. 5
3. Solve the following system of linear equations using Gauss elimination method :

$$\begin{aligned} -7x + 5y &= 3 \\ 2x - 8y &= -12 \end{aligned}$$

4. Show one iteration of solving the following system of linear equations using any iterative method. You may assume $x = y = 0$ as the initial estimate :

$$\begin{aligned} -6x + 8y &= -2 \\ 4x + 7y &= -11 \end{aligned}$$

5. Evaluate by Simpson's 1/3 rule $\int_0^1 \frac{x}{1+x} dx$ by taking six intervals. 5
6. Establish the relation between forward and backward differences. 5

Group - BAnswer any *two* questions.

10×2=20

7. Find the approximate value of $I = \int_0^1 \frac{dx}{1+x^2}$ using Trapezoidal rule dividing the interval into five equal parts.
8. Construct a difference table for the following data and mark the forward differences by underlying the numbers :

x	1	2	3	4	5	6	7	8
y	7	13	18	25	35	48	62	78

9. Using either Gauss-Jacobi iterative method or Gauss elimination method with partial pivoting, solve the following system of linear equations :

$$3x - 5y + 6z = 11$$

$$5x \quad \quad - 11z = -28$$

$$2y + 9z = 31$$

10. (a) Consider the initial-value problem : $y' = 0.2xy$, $y(1) = 1$. Use Euler's method to obtain an approximation to $y(1.2)$ using $h = 0.1$.
- (b) Find a real root for the equation $x^3 + x - 5 = 0$. Using Regula-Falsi method, taking x co-ordinates of initial points as $x = 0$ and $x = 2$. Perform only two iterations of the method. 5+5