

SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM Nagar, Kattankulathur – 603 203, Chengalpattu D.t.

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING *(Common to Department of Information Technology)*



QUESTION BANK

CS3362 – INTRODUCTION TO DATA SCIENCE

III SEMESTER

REGULATION 2023

ACADEMIC YEAR 2025-2026

Prepared by

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QUESTION BANK

SUBJECT : CS3362 – INTRODUCTION TO DATA SCIENCE
SEM / YEAR : III SEMESTER / II YEAR

UNIT I - INTRODUCTION			
Data Science: Benefits and uses – facets of data – Data Science Process: Overview – Defining research goals – Retrieving data – Data preparation – Exploratory Data analysis build the model – presenting findings and building applications – Data Mining – Data Warehousing – Basic Statistical descriptions of Data.			
PART - A			
Q. No.	Question	Level	Competence
1	Define Data Science.	BTL1	Remembering
2	List out the lifecycle of Data Science.	BTL1	Remembering
3	List the benefits of Data Science.	BTL1	Remembering
4	Summarize the Characteristics (5 V's) of Big data.	BTL2	Understanding
5	Compare Data Science and Big Data.	BTL2	Understanding
6	Infer the uses of Data Science.	BTL2	Understanding
7	Define unstructured data.	BTL1	Remembering
8	List the facets of Data.	BTL1	Remembering
9	Compare Structured and Unstructured Data.	BTL2	Understanding
10	What is Machine generated data?	BTL1	Remembering
11	What is Big Data?	BTL1	Remembering
12	Why is cleansing and integrating transformation done to data?	BTL1	Remembering
13	Show how to deal with missing data.	BTL2	Understanding
14	Explain streaming data.	BTL2	Understanding
15	Outline the knowledge mining in data.	BTL2	Understanding
16	List the various types of data.	BTL1	Remembering
17	List the types of error.	BTL1	Remembering
18	Infer what meta data is.	BTL2	Understanding
19	Summarize the importance of quantitative data.	BTL2	Understanding
20	Define Exploratory data analysis (EDA).	BTL1	Remembering
21	Explain the importance of correlation.	BTL2	Understanding
22	Illustrate what is dependent and independent variable.	BTL1	Remembering
23	Show an example for semi structured data.	BTL2	Understanding
24	Illustrate a diagram for building a data warehouse.	BTL2	Understanding

PART – B			
1	Classify the Facets of Data with brief explanation. (16)	BTL4	Analyzing
2	(i) Examine what data science is and list the benefits & uses. (6) (ii) Analyse the lifecycle of Data Science. (10)	BTL4	Analyzing
3	Examine in detail about the process of data science with necessary diagram. (16)	BTL4	Analyzing
4	(i) Define about Build the models. (6) (ii) Show the Exploratory data analysis with an example. (10)	BTL1	Remembering
5	(i) Compare Structured, Semi-structured and Unstructured data(10) (ii) Examine about Graph based data and Streaming data. (6)	BTL4	Analyzing
6	Discover Cleansing, integrating, and transforming data in detail. (16)	BTL4	Analyzing
7	Analyze about data mining steps in the process to knowledge discovery. (16)	BTL4	Analyzing
8	Model the building of Data warehouse and explain. (16)	BTL3	Applying
9	(i) Compare Structured and semi-structured data. (8) (ii) Discover about natural language and machine generated data. (8)	BTL4	Analyzing
10	Define Data mining and Construct the architecture in detail. (16)	BTL3	Applying
11	Examine the structured, unstructured and semi structured data with examples. (16)	BTL4	Analyzing
12	(i) Analyze in detail about defining a research goal. (8) (ii) Analyze and Explain about retrieving data. (8)	BTL4	Analyzing
13	Analyze and Explain about data warehousing. Discuss the advantage and disadvantages of data repositories. (16)	BTL4	Analyzing
14	Examine the importance of data pre-processing in detail. (16)	BTL4	Analyzing
15	Develop short notes on (i) Outlier. (8) (ii) Handling missing data. (8)	BTL3	Applying
16	Identify in detail about Data warehousing and its architecture. (16)	BTL3	Applying
17	Examine the basic statistical description of data with examples. (16)	BTL4	Analyzing

UNIT II - DESCRIBING DATA

Types of Data – Types of Variables – Describing Data with Tables and Graphs – Describing Data with Averages – Describing Variability – Normal Distributions and Standard (z) Scores.

PART – A

Q. No.	Question	Level	Competence
1	What is data? List the three types of data.	BTL1	Remembering
2	Define variable. Write down the types of variable.	BTL1	Remembering
3	Explain Relative and cumulative frequency distribution.	BTL2	Understanding
4	Find whether the following quantitative observations are discrete or continuous. (a) litter of mice (b) cooking time for pasta.	BTL1	Remembering
5	Infer the types of frequency distribution.	BTL2	Understanding
6	Summarize which average is best if distribution is not skewed.	BTL2	Understanding
7	Define percentile ranks.	BTL1	Remembering
8	What is grouped and ungrouped frequency distribution?	BTL1	Remembering
9	Illustrate with an example about qualitative and quantitative data.	BTL2	Understanding
10	Summarize the features of histogram.	BTL2	Understanding
11	What is frequency distribution?	BTL1	Remembering
12	Illustrate the formula for range and SD.	BTL2	Understanding
13	Define Mean, Median and Mode.	BTL1	Remembering
14	Show few graph for representing quantitative data.	BTL2	Understanding
15	Demonstrate the properties of normal curve.	BTL2	Understanding
16	Define the formula for z-score.	BTL1	Remembering
17	Explain about Stem and Leaf display.	BTL2	Understanding
18	Compare and contrast Independent and Dependent Variables.	BTL2	Understanding
19	List the different types of quartiles.	BTL1	Remembering
20	What is frequency polygon?	BTL1	Remembering
21	Explain the variance of data.	BTL2	Understanding
22	What is measure of variability?	BTL1	Remembering
23	Infer about degree of freedom.	BTL2	Understanding
24	What is interquartile range (IQR)?	BTL1	Remembering

PART – B

1	<p>(i) Categorize in detail about the three types of data with an example. (8)</p> <p>(ii) Classify whether each of the following terms is qualitative, ranked or quantitative. (8)</p> <p>(a) ethnic group (b) age (c) family size (d) academic major (e) third-place finish (f) gender (g) temperature</p>	BTL4	Analyzing																																			
2	Discover the various types of variables with an example. (16)	BTL4	Analyzing																																			
3	Classify the types of frequency distribution with examples. (16)	BTL4	Analyzing																																			
4	<p>The IQ scores for a group of 35 high school dropouts are as follows:</p> <table border="1" style="margin-left: 20px;"> <tr><td>91</td><td>85</td><td>84</td><td>79</td><td>80</td></tr> <tr><td>87</td><td>96</td><td>75</td><td>86</td><td>104</td></tr> <tr><td>95</td><td>71</td><td>105</td><td>90</td><td>77</td></tr> <tr><td>123</td><td>80</td><td>100</td><td>93</td><td>108</td></tr> <tr><td>98</td><td>69</td><td>99</td><td>95</td><td>90</td></tr> <tr><td>110</td><td>109</td><td>94</td><td>100</td><td>103</td></tr> <tr><td>112</td><td>90</td><td>90</td><td>98</td><td>89</td></tr> </table> <p>(a) Construct a frequency distribution for grouped data and explain the same. (b) Specify the real limits for the lowest class interval in this frequency distribution (16)</p>	91	85	84	79	80	87	96	75	86	104	95	71	105	90	77	123	80	100	93	108	98	69	99	95	90	110	109	94	100	103	112	90	90	98	89	BTL4	Analyzing
91	85	84	79	80																																		
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98	69	99	95	90																																		
110	109	94	100	103																																		
112	90	90	98	89																																		
5	Discover in detail about frequency distributions for qualitative (nominal) data. (16)	BTL4	Analyzing																																			
6	Discuss in detail about the graph for qualitative (nominal) data. (16)	BTL2	Understanding																																			
7	<p>(i) Examine in detail about Mean, Median and Mode. (8)</p> <p>(ii) Discover the Mean and Median for the following retirement ages: 60, 63, 45, 63, 65, 70, 55, 63, 60, 65, 63. (8)</p>	BTL4	Analyzing																																			
8	<p>Identify the following in detail.</p> <p>(i) Standard Deviation (8)</p> <p>(ii) SD exceeds mean deviation. (8)</p>	BTL3	Applying																																			
9	<p>(i) Examine in detail about describing data with tables. (8)</p> <p>(ii) Examine in detail about describing data with averages. (8)</p>	BTL4	Analyzing																																			
10	Identify the formula of Standard Deviation for Population (σ) and Standard Deviation for Sample (S) and explain with an example.(16)	BTL3	Applying																																			

11	Summarize in detail about mean and describe the two types of Mean with an example. (16)	BTL2	Understanding
12	Analyze the computation formula for the sum of squares, calculate the population standard deviation (σ) for the scores: 1, 3, 7, 2, 0, 4, 7, 3 and calculate sample standard deviation (S) for the scores: 10, 8, 5, 0, 1, 1, 7, 9, 2. (16)	BTL4	Analyzing
13	Develop a stem and leaf display from weights of Male. (16) 160 168 133 170 150 165 158 165 193 169 245 160 152 190 179 157 226 160 170 180 150 156 190 156 157 163 152 158 225 135 165 135 180 172 160 170 145 185 152 205 151 220 166 152 159 156 165 157 190 206 172 175 154	BTL6	Creating
14	Analyze how the following graphs are used to represent quantitative data. i) Histogram (8) ii) Frequency Polygon. (8)	BTL4	Analyzing
15	Explain in detail about IQR. Calculate IQQR for the following. (16) 7, 9, 9, 10, 11, 11, 13.	BTL2	Understanding
16	(i) Examine in detail about the Normal curve. (8) (ii) Examine in detail about z-score. (8)	BTL4	Analyzing
17	Identify about relative frequency distributions and cumulative frequency distribution with an example. (16)	BTL3	Applying

UNIT III - DESCRIBING RELATIONSHIPS

Correlation – Scatter plots – correlation coefficient for quantitative data –computational formula for correlation coefficient – Regression –regression line –least squares regression line – Standard error of estimate – interpretation of r^2 –multiple regression equations –regression towards the mean.

PART – A

Q. No	Questions	Level	Competence
1	Define correlation and its types.	BTL1	Remembering
2	Define Scatterplots.	BTL1	Remembering
3	List the advantages of Scatterplots.	BTL1	Remembering
4	Explain correlation strength and direction.	BTL2	Understanding
5	Define Regression.	BTL1	Remembering
6	What is ridge regression?	BTL1	Remembering
7	Infer Formula for correlation coefficient 'r'.	BTL2	Understanding
8	Classify the types of regression analysis.	BTL2	Understanding
9	Explain the need for correlation.	BTL2	Understanding
10	Classify the types of relationships in the Scatterplots.	BTL2	Understanding
11	Compare the difference between single and multiple linear regression.	BTL2	Understanding
12	Explain Little or No Relationship in the Scatter plots.	BTL1	Remembering

13	List the features of ridge regression.	BTL1	Remembering																		
14	Outline decision tree.	BTL2	Understanding																		
15	Differentiate linear relationship and non-linear relationship.	BTL2	Understanding																		
16	What is a Least Squares Regression Line?	BTL1	Remembering																		
17	Illustrate can we do multiple regression with 2 Variables?	BTL2	Understanding																		
18	Summarize the key properties of correlation coefficient 'r'.	BTL2	Understanding																		
19	Demonstrate a positive and negative correlation.	BTL2	Understanding																		
20	Define a regression towards mean.	BTL1	Remembering																		
21	Infer interpretation of r^2 ?	BTL2	Understanding																		
22	When does regression fallacy occur?	BTL1	Remembering																		
23	What is restricted range?	BTL1	Remembering																		
24	What is curvilinear relationship?	BTL1	Remembering																		
PART – B																					
1	Analyze correlation coefficient and explain in detail. (16)	BTL4	Analyzing																		
2	Define standard error of estimation. With an example, discover in detail about how standard error of estimation plays a useful role in data science. (16)	BTL4	Analyzing																		
3	Organize the types of regression analysis in detail. (16)	BTL3	Applying																		
4	Analyze and calculate correlation coefficient 'r' using computation formula for the following data. (16)	BTL4	Analyzing																		
<table border="1"> <thead> <tr> <th>FRIENDS</th> <th>SENT</th> <th>RECEIVED</th> </tr> </thead> <tbody> <tr> <td>Dories</td> <td>13</td> <td>14</td> </tr> <tr> <td>Steve</td> <td>9</td> <td>18</td> </tr> <tr> <td>Mike</td> <td>7</td> <td>12</td> </tr> <tr> <td>Andrea</td> <td>5</td> <td>10</td> </tr> <tr> <td>John</td> <td>1</td> <td>6</td> </tr> </tbody> </table>				FRIENDS	SENT	RECEIVED	Dories	13	14	Steve	9	18	Mike	7	12	Andrea	5	10	John	1	6
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5	Develop how correlation coefficient can be calculated for the quantitative data? (16)	BTL3	Applying																		
6	Examine the computation formula for correlation coefficient with an example. (16)	BTL4	Analyzing																		
7	Develop the concept of Scatter plot construction with an example. (16)	BTL3	Applying																		
8	Analyze briefly about Positive, Negative, Little or No Relationship in the scatter plot with an example. (16)	BTL4	Analyzing																		
9	(i) Model a positive and negative relationship with an example. (8) (i) Model a Curvilinear Relationship with an example. (8)	BTL3	Applying																		
10	Define Regression and explain in detail with an example. (16)	BTL3	Applying																		
11	Examine the Standard error of estimate $s_{y x}$ with an example. (16)	BTL4	Analyzing																		
12	Identify the following. (16) i) Key Properties of 'r' ii) Sign of 'r' iii) Numerical Value of 'r'.	BTL4	Analyzing																		

13	Assess a detailed sketch of the Least Squares Regression Line. (16)	BTL5	Evaluating																					
14	Examine the concept of Regression towards the mean. (16)	BTL4	Analyzing																					
15	<p>Couples who attend a clinic for first pregnancies are asked to estimate (independently of each other) the ideal number of children. Given that X and Y represent the estimates of females and males, respectively, the results are as follows:</p> <table border="1"> <thead> <tr> <th>COUPLE</th> <th>X</th> <th>Y</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>1</td> <td>2</td> </tr> <tr> <td>B</td> <td>3</td> <td>4</td> </tr> <tr> <td>C</td> <td>2</td> <td>3</td> </tr> <tr> <td>D</td> <td>3</td> <td>2</td> </tr> <tr> <td>E</td> <td>1</td> <td>0</td> </tr> <tr> <td>F</td> <td>2</td> <td>3</td> </tr> </tbody> </table> <p>Calculate a value for 'r', using the computation formula. (16)</p>	COUPLE	X	Y	A	1	2	B	3	4	C	2	3	D	3	2	E	1	0	F	2	3	BTL3	Applying
COUPLE	X	Y																						
A	1	2																						
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E	1	0																						
F	2	3																						
16	Examine the concept of Interpretation of r^2 with an example. (16)	BTL4	Analyzing																					
17	<p>Calculate the standard error of estimate for the data Assume that an r of .30 describes the relationship between educational level (highest grade completed) and estimated number of hours spent reading each week. More specifically: and assume that the correlation of .30 is based on n = 35 pairs of observations</p> <table border="1"> <thead> <tr> <th>EDUCATIONAL LEVEL (X)</th> <th>WEEKLY READING TIME (Y)</th> </tr> </thead> <tbody> <tr> <td>$\bar{X} = 13$</td> <td>$\bar{Y} = 8$</td> </tr> <tr> <td>$SS_x = 25$</td> <td>$SS_y = 50$</td> </tr> <tr> <td colspan="2" style="text-align: center;">$r = .30$</td> </tr> </tbody> </table> <p>(16)</p>	EDUCATIONAL LEVEL (X)	WEEKLY READING TIME (Y)	$\bar{X} = 13$	$\bar{Y} = 8$	$SS_x = 25$	$SS_y = 50$	$r = .30$		BTL5	Evaluating													
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UNIT IV – PYTHON LIBRARIES FOR DATA WRANGLING

Basics of Numpy arrays –aggregations –computations on arrays –comparisons, masks, boolean logic – fancy indexing – structured arrays – Data manipulation with Pandas – data indexing and selection – operating on data – missing data – Hierarchical indexing – combining datasets – aggregation and grouping – pivot tables

Q. No.	Question	Level	Competence
PART - A			
1.	What is NumPy in python used for?	BTL1	Remembering
2.	Write a python library create an array?	BTL1	Remembering

3.	Write the output for the following numpy code? (i) <code>np.array([3,14,4,2,3])</code> (ii) <code>np.array([1,2,3,4],dtype='float32')</code>	BTL2	Understanding
4.	Define series object.	BTL1	Remembering
5.	What is Data frame?	BTL1	Remembering
6.	How a pandas data frame can be constructed?	BTL2	Understanding
7.	What are indexers?	BTL2	Understanding
8.	How missing data can be handled in python?	BTL2	Understanding
9.	How the operations can be performed on null values in pandas data science?	BTL2	Understanding
10.	Define Hierarchical indexing.	BTL1	Remembering
11.	What is pivot table?	BTL1	Remembering
12.	Identify the details maintained by python to store an integer	BTL2	Understanding
13.	Write python code to create 1D,2D and 3D numpy arrays.	BTL2	Understanding
14.	How do you verify the shape of 1D, 2D and 3D/ND array respectively?	BTL2	Understanding
15.	Compare python list with arrays.	BTL2	Understanding
16.	Write short note on python array object.	BTL1	Remembering
17.	How to perform slicing to access the elements of numpy arrays.	BTL2	Understanding
18.	List is mutable. Justify this with suitable example.	BTL2	Understanding
19.	What is indexing and negative indexing in tuple.	BTL2	Understanding
20.	Write the list of aggregate functions of numpy.	BTL1	Remembering
21.	What is fancy indexing?	BTL1	Remembering
22.	Write short note on pandas.	BTL1	Remembering
23.	What is reindexing in pandas?	BTL1	Remembering
24.	What is universal function?	BTL1	Remembering
PART – B			
1.	Briefly explain the basics of numpy arrays with example. (16)	BTL3	Apply

2.	Describe about fancy indexing with an example. (16)	BTL3	Apply
3.	Explain structured data in a numpy array. (16)	BTL4	Analyze
4.	What is a universal function? Explain clearly each function with examples. (16)	BTL3	Apply
5.	What is an aggregate function? Elaborate about the aggregate functions in Numpy. (16)	BTL3	Apply
6.	Explain broadcasting rules with examples (16)	BTL4	Analyze
7.	Explain data objects in pandas. (16)	BTL4	Analyze
8.	Explain how aggregation, grouping and data pivoting can be performed with Pandas. (16)	BTL4	Analyze
9.	What is a pivot table? Explain in detail. (16)	BTL4	Analyze
10	Consider that, an E-Commerce organization like Amazon. have different regions sales as NorthSales, SouthSalea, WestSales. EastSales.csv files. They want to combine North and West region sales and South and East sales to find the aggregate sales of these collaborating regions. Help them to do so using Python code. (16)	BTL3	Apply
11	Explain grouping in python with example.(16)	BTL4	Analyze
12	Explain the following in detail: (i)Attributes of arrays and Indexing of arrays (8) (ii)Slicing of arrays and Reshaping of arrays(8)	BTL4	Analyze
13	Explain the following in python (i) Data indexing (8) (ii) Operation on missing data (8)	BTL4	Analyze
14	(i)What is broadcasting? Explain the rules of broadcasting with an example. (8) (ii) Elaborate about the mapping between Python operators and Pandas methods.(8)	BTL3	Apply
15	Explain how pandas can be used for creating hierarchical indexes. (16)	BTL4	Analyze
16	Explain the various techniques that can be used for handling different levels of missing data.(16)	BTL3	Apply
17	Explain in detail about Data Frames with an example.(16)	BTL4	Analyze

UNIT V – DATA VISUALIZATION

Importing Matplotlib – Line plots – Scatter plots – visualizing errors – density and contour plots – Histograms – legends – colors – subplots – text and annotation – customization – three dimensional plotting - Geographic Data with Basemap - Visualization with Seaborn.

O.No	Question	Level	Competence
PART - A			
1.	What is the purpose of matplotlib?	BTL1	Remembering
2.	Write the dual interface of matplotlib?	BTL1	Remembering
3.	How to draw a simple line plot using matplotlib?	BTL2	Understanding
4.	What functions can be used to draw scatter plots?	BTL2	Understanding
5.	Write the difference between plot and scatter functions?	BTL1	Remembering
6.	How do you visualize error bars?	BTL2	Understanding
7.	What are legends in data visualization?	BTL2	Understanding
8.	What are Visualization Annotations?	BTL2	Understanding
9.	How do you create an axes?	BTL2	Understanding
10.	Define contour plots?	BTL1	Remembering
11.	What functions can be used to draw contour plots?	BTL2	Understanding
12.	What is the purpose of histogram?	BTL1	Remembering
13.	Write a source code to draw a simple histogram.	BTL1	Remembering
14.	How to create a 3-D wireframe plot?	BTL2	Understanding
15.	Define surface plot?	BTL1	Remembering
16.	What is the use of seaborn?	BTL2	Understanding
17.	What are pair plots?	BTL1	Remembering
18.	What is density plot?	BTL1	Remembering
19.	Mention the significance of subplots.	BTL1	Remembering
20.	Brief on basemap tool kit.	BTL2	Understanding
21.	Write python code to plot sine and cos wave.	BTL2	Understanding
22.	How can you set different colors for line plot.	BTL2	Understanding
23.	List the applications of lineplot.	BTL1	Remembering
24.	Write the syntax of scatter() method.	BTL1	Remembering

PART – B			
1.	What is matplotlib? Specify the two interfaces used by it. (16)	BTL4	Analyze
2.	Briefly explain about the line plot and scatter plot. (16)	BTL4	Analyze
3.	Explain contour plot and histogram. (16)	BTL4	Analyze
4.	What is 3D plotting? Explain it with examples. (16)	BTL3	Apply
5.	How can graphical data be projected using matplotlib? Explain with examples. (16)	BTL3	Apply
6.	Discuss about Geographic Data with Basemap in detail. (16)	BTL4	Analyze
7.	Write python program to plot line chart by assuming your own data and explain various attribute of line chart. (16)	BTL4	Analyze
8.	Write short notes on text and annotation. (16)	BTL4	Analyze
9.	How text and image annotations are done using Python? Give an example of your own with appropriate Python code. (16)	BTL3	Apply
10.	Explain various features of Matplotlib platform used for data visualization and illustrate its challenges. (16)	BTL4	Analyze
11.	Explain the different types of joins in python. (16)	BTL4	Analyze
12.	Explain about various visualization charts like line plots, scatter plots and histograms using Matplotlib with an example. (16)	BTL4	Analyze
13.	Illustrate about Importing Matplotlib with an example. (16)	BTL3	Apply
14.	Illustrate subplots with an example (8) Explain its various applications. (8)	BTL3	Apply
15.	Demonstrate the usage of histograms for data exploration and explain its attributes. (16)	BTL3	Apply
16.	Illustrate Visualization using Seaborn with an example. (16)	BTL3	Apply
17.	Perform an exploratory data analysis for the following data with different types of plots: The dataset contains cases from a study that was conducted between 1958 and 1970 at the University of Chicago's Billings Hospital on the survival of patients who had undergone surgery for breast cancer. Data attributes:- Age of patient at the time of operation (numerical) Patient's year of operation (year – 1900, numerical) Number of positive axillary nodes detected (numerical) Survival status (class attribute) 1 = the patient survived 5 years or longer, 2 = the patient died within 5 year. (16)	BTL3	Apply