

**SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)**

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QUESTION BANK(DESCRIPTIVE)

Subject with Code: R Programming for Data Science(20CS1104)

Year & Sem: III & II

Course & Branch: B.Tech & CAD

Regulation: R20

UNIT – I

INTRODUCTION TO R PROGRAMMING

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|----|---|-----------|-------|
| 1 | What is R? Briefly describe the history and development of the R programming language. | [L2][CO1] | [12M] |
| 2 | a) Explain the different ways to run R code, including using the R console, R scripts, and R Markdown. | [L2][CO1] | [6M] |
| | b) Classify the advantages and disadvantages of each method for running R code. | [L4][CO1] | [6M] |
| 3 | a) What are R sessions, and how do you manage them effectively? | [L2][CO1] | [6M] |
| | b) Illustrate the concept of functions in R with a program, and how to define and use them? | [L3][CO1] | [6M] |
| 4 | a) Demonstrate basic math operations with program, such as addition, subtraction, multiplication, and division. | [L2][CO1] | [6M] |
| | b) Categorize the order of operations in R and how to use parentheses to control the evaluation of expressions with an example program. | [L4][CO1] | [6M] |
| 5 | a) Illustrate how to declare and assign values to variables in R with a program? | [L3][CO1] | [6M] |
| | b) Discuss the different naming conventions and rules for variable naming, each with example in R. | [L2][CO1] | [6M] |
| 6 | a) Classify different data types in R with example. | [L4][CO1] | [6M] |
| | b) Conclude how to check the data type of a variable and convert between different data types. | [L4][CO1] | [6M] |
| 7 | Classify different data structures in R with examples. | [L4][CO1] | [12M] |
| 8 | a) i)Create a program for manipulating data frames in R.
ii)Create a program for manipulating lists in R. | [L6][CO1] | [6M] |
| | b) Determine Vector and its functions with examples. | [L3][CO1] | [6M] |
| 9 | a) Differentiate between matrices and data frames? | [L4][CO1] | [6M] |
| | b) Create a program for 2x3 matrix and accessing its second row?
Discriminate the following data structures with syntax and example. | [L6][CO1] | [6M] |
| | a) i)Arrays
ii)Matrices | [L5][CO1] | [6M] |
| 10 | Demonstrate how to create, manipulate, and perform operations on these data structures. | | |
| | b) i)Lists
ii)Data Frames | [L2][CO1] | [6M] |

UNIT – II

R PROGRAMMING STRUCTURES, OPERATORS AND FUNCTIONS

1	Illustrate different conditional statements in R with appropriate syntax and examples.	[L3][CO2]	[12M]
	a) Explain working of switch case in R with an example program.	[L2][CO2]	[6M]
2	b) Develop a R program to check for leap year or not.	[L6][CO2]	[6M]
	a) Illustrate for loop in R and demonstrate its usage.	[L3][CO2]	[6M]
3	Explain the while loop and create a program for finding the sum of natural numbers.	[L6][CO2]	[6M]
	a) Describe how to iterate over a list or a data frame using a loop.	[L2][CO2]	[6M]
4	Explain the lapply and sapply functions and their use cases and create a program that uses lapply to apply a function to each element of a list and returns a new list.	[L6][CO2]	[6M]
	a) Compare the functions next and break with example program.	[L5][CO2]	[6M]
5	Explain the concept of nested if-else statements and prepare an example that uses the ifelse() function to create a new vector based on conditions.	[L6][CO2]	[6M]
	a) Classify various types of operators in R and write about any two operators.	[L4][CO2]	[6M]
6	Write a program that demonstrates the use of various arithmetic and Boolean operators.	[L2][CO2]	[6M]
	a) Explain how to set default values for function arguments in R.	[L2][CO2]	[6M]
7	Justify the importance of default values and their use cases and create a function that takes two arguments with default values and returns their sum.	[6][CO2]	[6M]
	a) Describe the return() function in R and its purpose.	[L2][CO2]	[6M]
8	b) Illustrate the concept of implicit return in R functions.	[L3][CO2]	[6M]
	a) Discuss the factors to consider when deciding whether to use an explicit return () statement.	[L2][CO2]	[6M]
9	Explain how to return complex objects, such as lists or data frames, from R functions.	[L1][CO2]	[6M]
	a) Illustrate the concept of functions being first-class citizens in R.	[L3][CO2]	[6M]
10	Discuss the absence of pointers in R. create a recursive function that calculates the nth Fibonacci number.	[L6][CO2]	[6M]

UNIT – III

MATH FUNCTIONS, SIMULATION IN R AND EXTENDED EXAMPLE

CALCULATING PROBABILITY

1	Identify different built-in mathematical functions in R with for example for each	[L3][CO3]	[12M]
2	a) Categorize the different methods for calculating minimum, maximum, and cumulative sum statistics on vectors in R.	[L4][CO3]	[6M]
	b) Differentiate between cumulative sums and products in the context of numerical analysis within R.	[L4][CO3]	[6M]
3	a) Create a R program for calculating the probability.	[L6][CO3]	[6M]
	b) Explain following functions with example i)dnorm ii)qchisq iii)qbinom iv)rnorm	[L2][CO3]	[6M]
4	Evaluate the capabilities of R for performing basic calculus operations (e.g., differentiation, integration).	[L5][CO3]	[12M]
5	Explain efficient techniques for sorting data vectors in R based on specific criteria .	[L2][CO3]	[12M]
6	a) Classify fundamental linear algebra operations on vectors and matrices in R, including addition, subtraction, and scalar multiplication .	[L4][CO3]	[6M]
	b) Prioritize an example (excluding vector cross product) of how vector operations are used in linear algebra applications within R.	[L4][CO3]	[6M]
7	Demonstrate the vector cross product and its applications in R.	[L2][CO3]	[12M]
8	a) Distinguish Markov chains and their significance in modeling probabilistic systems.	[L4][CO3]	[6M]
	b) Illustrate how to import data in R programming.	[L3][CO3]	[6M]
9	a) Classify set operations (union, intersection, difference) and their implementation for data manipulation in R.	[L4][CO3]	[6M]
	b) Explain reading and writing files in R.	[L2][CO3]	[6M]
	a) What is the purpose of getwd() and setwd() functions in R	[L4][CO3]	[6M]
10	Explain the purpose of the following functions in R: b) i. read.csv() ii. write.csv() iii. read.xlsx()	[L2][CO3]	[6M]

UNIT-4

GRAPHICS

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|----|---|-----------|-------|
| 1 | a) Describe the role of the plot() function in R base graphics . | [L2][CO4] | [6M] |
| | b) What are the essential components required to create a graph using the plot() function ? | [L6][CO4] | [6M] |
| 2 | a) How do you customize the appearance of a graph using the plot() function in R ? | [L2][CO4] | [6M] |
| | b) Illustrate the concept of data visualization and its importance in data analysis. | [L3][CO4] | [6M] |
| 3 | a) Discuss the advantages of using R base graphics for creating graphs. | [L2][CO4] | [6M] |
| | b) Categorize some common types of graphs that can be created using the plot() function. | [L4][CO4] | [6M] |
| 4 | a) How do you add labels to the axes of a graph created with the plot() function? | [L2][CO4] | [6M] |
| | b) Describe the process of changing the color and line type of a plot in R. | [L2][CO4] | [6M] |
| 5 | a) Explain the significance of customizing the title of a graph in data visualization. | [L2][CO4] | [6M] |
| | b) Assess the use of the main parameter in the plot() function for adding a title to a graph. | [L5][CO4] | [6M] |
| 6 | a) Illustrate Data visualization with R and ggplot2. | [L3][CO4] | [6M] |
| | b) Identify the different options available for adjusting the size and aspect ratio of a graph in R. | [L3][CO4] | [6M] |
| 7 | a) Outline the process of saving a graph created with the plot() function to a file in R. | [L2][CO4] | [6M] |
| | b) Discover the purpose of the file parameter in the plot() function for saving graphs. | [L3][CO4] | [6M] |
| 8 | a) List and explain about different R – Charts and Graphs in R. | [L2][CO4] | [6M] |
| | b) Discriminate the importance of choosing an appropriate file format when saving a graph in R. | [L5][CO4] | [6M] |
| 9 | a) How do you specify the dimensions and resolution of a saved graph in R? | [L2][CO4] | [6M] |
| | b) Describe the process of exporting a graph to different file formats using the plot() function. | [L2][CO4] | [6M] |
| 10 | Develop a code to demonstrate various charts using tree datasets for the following
a. Histogram
b. Scatter plot
c. Box plot
d. Line chart | [L3][CO4] | [12M] |

UNIT-5

PROBABILITY DISTRIBUTIONS AND LINEAR REGRESSION

- 1 a) Classify the characteristics of the normal distribution and provide an example of its application in real-world data analysis. [L4][CO5] [6M]
 - 1 b) Identify the properties of the binomial distribution and give an example of its use. [L3][CO5] [6M]
 - 2 a) What are the key features of the Poisson distribution, and when is it commonly used. [L1][CO5] [3M]
 - 2 b) Discuss about standard deviation with example. [L2][CO5] [7M]
 - 3 a) Determine basic statistics and explain their importance in data analysis? [L3][CO5] [6M]
 - 3 b) Illustrate the concepts of correlation and covariance and explain how they are calculated. [L3][CO5] [6M]
 - 4 a) Analyze the purpose of T-tests in statistical analysis and provide examples of when they are used. [L4][CO5] [6M]
 - 4 b) Distinguish the use of ANOVA (Analysis of Variance) in comparing means across multiple groups. [L5][CO5] [6M]
 - 5 a) Examine the concept of linear models and give an example of simple linear regression. [L4][CO5] [6M]
 - 5 b) Describe the process of multiple regression and its applications. [L2][CO5] [6M]
 - 6 a) Discuss generalized linear models and their advantages over traditional linear models. [L6][CO5] [6M]
 - 6 b) Explain the logistic regression model and provide an example of its use. [L2][CO5] [6M]
- Apply the regression models: [L3][CO5] [12M]
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|-----------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| <i>height</i> | 176 | 154 | 138 | 196 | 132 | 176 | 181 | 169 | 150 | 175 |
| <i>bodymass</i> | 82 | 49 | 53 | 112 | 47 | 69 | 77 | 71 | 62 | 78 |
- 7 For the above data:
 - Perform linear regression and display the result.
 - Create a Regression plot with the following specifications.
 - Display the title of the graph as “Height Vs. Bodymass”
 - Set the color of the plot as blue
 - 8 a) Assess the Poisson regression model and its application in analyzing count data. [L5][CO6] [6M]
 - 8 b) Summarize advantages of using Random Forest. [L2][CO6] [6M]
 - 9 a) Explain the structure of decision tree. [L2][CO6] [6M]
 - 9 b) Categorize the principles behind decision trees and their application in random forests. [L4][CO6] [6M]
 - 10 a) Discuss the advantages of random forests over traditional statistical models. [L2][CO6] [6M]
 - 10 b) Give examples of real-world scenarios where random forests are used for predictive modeling. [L2][CO6] [6M]

Prepared by:
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