**YMCA University of Science and Technology, Faridabad**
**BCA Scheme of Studies /  Examination**
**Semester – IV**

| Course No. | Course Title | Schedule | | | | Sessional Marks/ Internal | Marks for End Term Examination | | Total Marks | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| | | I | T | P | Total | | Theory | Practical | | |
| BCA-DS-211 | Artificial Intelligence | 3 | - | | 3 | 25 | 75 | - | 100 | 3 |
| BCA-DS-212 | Programming in Java | 3 | - | | 3 | 25 | 75 | - | 100 | 3 |
| BCA-DS-213 | Scientific R Programming | 3 | - | | 3 | 25 | 75 | - | 100 | 3 |
| BCA-DS-214 | Computer Networks | 3 | - | | 3 | 25 | 75 | - | 100 | 3 |
| As per list above | General Elective - II | 3 | - | | 3 | 25 | 75 | - | 100 | 3 |
| As per list above | Audit Course (No credit just qualifying) | 2 | | | 2 | | 50 | | Marks will not be added in total | No Credit |
| BCA-DS-215 | Java Programming Lab | - | | 4 | 4 | 25 | - | 50 | 75 | 2 |
| BCA-DS-216 | R Programming Lab | - | | 4 | 4 | 25 | - | 50 | 75 | 2 |
| BCA-DS-217 | Presentation | - | | 2 | 2 | 25 | - | | 25 | 1 |
| BCA-DS-218 | Group Discussion | - | | 2 | 2 | 25 | - | | 25 | 1 |
| | Total | | | | 29 | 225 | 375 | 100 | 700 | 21 |

**Note: Exam duration will be as under**
      (a) **Theory exams will be of 3 hours duration**
      (b)**Practical exams will be of 3 hours duration**

# BCA-DS-211 ARTIFICIAL INTELLIGENCE
## *BCA IV Semester*

No. of Credits: 3            Sessional:       25 Marks
L T     P    Total          Theory :        75 Marks
3 0      0    3             Total  :         100 Marks
                                      Duration of Exam:    3 Hours

**Note:** Examiner will be required to set *Seven* questions in all having two parts. Part I will have Question Number 1 consisting of total 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be *Six* questions. Examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions from Part II.

## COURSE OBJECTIVES:
The aim of the course is to introduce to the field of Artificial Intellige nce (AI) with emphasis on its use to solve real world problems for which solutions are difficult to express using the traditiona l algorithmic approach. It explores the essential theory behind methodologies for developing systems that demonstrate intelligent behavior including dealing with uncertainty, learning from experience and following problem solving strategies found in nature.

## SYLLABUS

### UNIT - I
**Overview of A.I:** Introduction to AI, Importance of AI, AI and its related field, AI techniques, Criteria for success.

**Problems, problem space and search**: Defining the problem as a state space search, Production system and its characteristics, Issues in the design of the search problem.

**Heuristic search techniques** : Generate and test, hill climbing, best first search technique, problem reduction, constraint satisfaction

### UNIT - II
**Knowledge Representation:** Definition and importance of knowledge, Knowledge representation, and various approaches used in knowledge representation, Issues in knowledge representation, Knowledge representation using rules, rules based deduction system, resolution.

**Using Predicate Logic:** Represent ting Simple Facts in logic, representing instances and is-a relationship, Computable function and predicate.

### UNIT - III
**Planning:** Planning in Situational Calculus, representation for planning, partial order planning algorithm
**Learning:** Introduction learning, Rote learning, learning by taking advice, learning in problem solving, learning from example-induction, Explanation based learning.

**UNIT – IV**
**Expert System:** Introduction, representing using domain specific knowledge, Agents and its types.
**Natural language processing:** Introduction syntactic processing, Semantic processing, Discourse and pragmatic processing.

## COURSE OUTCOMES:

On completion of the course students will be able to
1. Understand the various searching techniques, constraint satisfaction problem and example problems- game playing techniques.
2. Apply these techniques in applications which involve perception, reasoning and learning.
3. Explain the role of agents and how it is related to environment and the way of evaluating it and how agents can act by establishing goals.
4. Acquire the knowledge of real world Knowledge representation.

## Text Books/ Reference Books:

1. Elaine Rich, Kevin Knight: Artificial Intelligence, Tata McGraw Hill.
2. David W. Rolston: Principles of Artificial Intelligence and Expert System Development, McGraw Hill Book Company.
3. D.W. Patterson, "Introduction to AI and Expert Systems", PHI, 1999.
4. Nils J Nilsson, "Artificial Intelligence -A new Synthesis" 2nd Edition (2000), Harcourt Asia Ltd.

**Note: Latest and additional good books may be suggested and added from time to time.**

# BCA-DS-212: PROGRAMMING IN JAVA
## *BCA IV Semester*

| | | | | | |
|---|---|---|---|---|---|
| No. of Credits: 3 | | | | Sessional: | 25 Marks |
| L T | P | Total | | Theory : | 75 Marks |
| 3 0 | 0 | 3 | | Total : | 100 Marks |
| | | | | Duration of Exam: | 3 Hours |

**Note:** Examiner will be required to set *Seven* questions in all having two parts. Part I will have Question Number 1 consisting of total 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be *Six* questions. Examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions from Part II.

## COURSE OBJECTIVES:
The course will introduce standard tools and techniques for software development, using object oriented approach, use of a version control system, an automated build process, an appropriate framework for automated unit and integration tests.

## SYLLABUS

### UNIT - I
**Object Oriented Methodology-1:** Paradigms of Programming Languages, Evolution of OO Methodology, Basic Concepts of OO Approach, Comparison of Object Oriented and Procedure , Oriented Approaches, Benefits of OOPs, Introduction to Common OO Language, Applications of OOPs,

**Object Oriented Methodology-2**: Classes and Objects, Abstraction and Encapsulat io n, Inheritance, Method Overriding and Polymorphism.

### UNIT – II
**Java Language Basics***:* Introduction to Java, Basic Features, Java Virtual Machine Concepts, Primitive Data Type and Variables, Java Operators, Expressions, Statements and Arrays.

**Object Oriented Concepts**: Class and Objects--Class Fundamentals, Creating objects, Assigning object reference variables; Introducing Methods, Static methods, Constructors, Overloading constructors; This Keyword; Using Objects as Parameters, Argument passing, Returning objects, Method overloading, Garbage Collection, The Finalize ( ) Method.

**Inheritance and Polymorphism**: Inheritance Basics, Access Control, Multilevel  Inherita nce, Method Overriding, Abstract Classes, Polymorphism, Final Keyword

### UNIT - III
**Packages:** Defining Package, CLASSPATH, Package naming, Accessibility of Packages, using Package Members.

**Interfaces:** Implementing Interfaces, Interface and Abstract Classes, Extends and Impleme nts together. Exceptions Handling: Exception, Handling of Exception, using try-catch, Catching Multiple Exceptions, using finally clause, Types of Exceptions, Throwing Exceptions, and Writing Exception Subclasses.

**UNIT - IV**
**Multithreading:** Introduction, The Main Thread, Java Thread Model, Thread Priorities, Synchronization in Java, Inter thread Communication.

**I/O in Java**: I/O Basics, Streams and Stream Classes, The Predefined Streams, reading from, and Writing to, Console, Reading and Writing Files, The Transient and Volatile Modifiers, Using Instance of Native Methods.

**Strings and characters**: Fundamentals of Characters and Strings, the String Class, String Operations, Data Conversion using Value Of ( ) Methods, String Buffer Class and Methods.

**COURSE OUTCOMES:**
After taking the course, students will be able to:
1. Specify simple abstract data types and design implementations, using abstraction functio ns to document them.
2. Recognize features of object-oriented design such as encapsulation, polymorphis m, inheritance, and composition of systems based on object identity.
3. Name and apply some common object-oriented design patterns and give examples of their use.
4. Design applications with an event-driven graphical user interface.

**Text Books/ Reference Books:**
1. E Balagurusamy: Programming in Java.
2. Herbert Schildt: The Complete Reference JAVA, TMH Publication.
3. Begining JAVA, Ivor Horton, WROX Public.
4. Stephen Potts: JAVA 2 UNLEASHED, Tech Media Publications.
5. Patrick Naughton and Herbertz Schildt, "Java-2 The Complete Reference", 1999, TMH.

**Note: Latest and additional good books may be suggested and added from time to time** .

# BCA-DS-213 SCIENTIFIC R PROGRAMMING
## *BCA IV SEMESTER*

No. of Credits: 3                    Sessional:          25 Marks
L T     P    Total                   Theory :            75 Marks
3 0     0    3                       Total :             100 Marks
                                     Duration of Exam:   3 Hours

**Note:** Examiner will be required to set *Seven* questions in all having two parts. Part I will have Question Number 1 consisting of total 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be *Six* questions. Examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions from Part II.

## COURSE OBJECTIVES:

1.    an introduction to resources for continuing to develop their R skill set.
2.    the ability to perform basic data transformation, analysis and visualisation with R.
3.    a framework for applying R to their own domain-specific problems
4.    Familiarize participants with R syntax
5.    Understand the concepts of objects and assignment
**6.**   Understand the concepts of vector and data type

## SYLLABUS

### UNIT -1: Introduction to R

What is R, History of R, Installing R, Package installation, choosing IDE, first program, help in R, Some information about R commands, special values, Objects, Functions, Simple Manipulations: Vectors and numbers, Matrices and arrays, Factors, List, data Frames.

### UNIT-2: Programming using R

Function Creation, scripts, Logical operators, Conditional Statements, Loops in R, switch Statement. List and Data Frames: Creating a list, Common List operations, Recursive list, creating a datagram, common data frame operations, using lapply () and sapply () functions.

Object oriented programming with R, S3 Classes, S4 Classes, Reference Classes

### UNIT-3: Data handling in R

Saving and loading R data, import and export to CSV files, import and export via ODBC, Debugging Techniques in R, Statistical Graphics: Base Graphics, ggplot2

### UNIT-4: Mathematical and statistical Concept using R

Maximum, Minimum, Frequency distribution, Measures of central tendency, Hypothesis testing, Correlation, Different statistical distribution.

**COURSE OUTCOMES:**

At the end of this course, each student will be able to:
1. Understand basic concepts such as data type and index and use them in their work.
2. Demonstrate use of basic functions.
3. Conceptualize and create loops to solve different types of problems.
4. Create their own customized functions.
5. Construct tables and figures for descriptive statistics.
6. Learn to understand new data sets and functions by themselves.

**Text Books/Reference Books:**
1. Sandeep Rakshit, R for Beginners, McGraw-Hill Education
2. Hadley Wickham,GarrettGrolemund , Hands-On Programming with R: Write Your Own Functions and Simulations.
3. Tilman M. Davies, The Book of R:A first course in Programming and Statistics.
4. Jared P. Lander, R for Everyone: Advanced Analytics and Graphics, Pearson
5. Christian Heumann, Michael Schomaker and Shalabh, Introduction to Statistics and Data Analysis - With Exercises, Solutions and Applications in R , Springer, 2016
6. By Alain F. Zuur, Elena N. Ieno, Erik H.W.G. Meesters, A Beginner's Guide to R (Use R) Springer 2009

**Note: Latest and additional good books may be suggested and added from time to time.**

# BCA-DS-214: COMPUTER NETWORKS
## *BCA IV Semester*

No. of Credits: 3

L T    P    Total

3 0     0    3

Sessional:      25 Marks

Theory :      75 Marks

Total :      100 Marks

Duration of Exam:    3 Hours

**Note:** Examiner will be required to set *Seven* questions in all having two parts. Part I will have Question Number 1 consisting of total 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be *Six* questions. Examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions from Part II.

## COURSE OBJECTIVES:
1      To develop an understanding of modern network architectures from a design and performance perspective.
2.     To introduce the student to the major concepts involved in wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs).
3.     To provide an opportunity to do network programming
4.     To provide a WLAN measurement ideas.

## SYLLABUS

### UNIT: I
**OSI Reference Model and Network Architecture:** Introduction to Computer Networks, Example networks ARPANET, Internet, Private Networks, Network Topologies: Bus-, Star-, Ring-, Hybrid -, Tree -, Complete -, Irregular –Topology; Types of Networks: Local Area Networks, Metropolitan Area Networks, Wide Area Networks; Layering architecture of networks, OSI model, Functions of each layer, Services and Protocols of each layer

### UNIT-II
**TCP/IP:** Introduction, History of TCP/IP, Layers of TCP/IP, Protocols, Internet Protocol, Transmission Control Protocol, User Datagram Protocol, IP Addressing, IP address classes, Subnet Addressing, Internet Control Protocols, ARP, RARP, ICMP, Application Layer, Domain Name System, Email – SMTP, POP, IMAP; FTP, NNTP, HTTP, Overview of IP version 6.

### UNIT-III
**Local Area Networks:** Introduction to LANs, Features of LANs, Components of LANs, Usage of LANs, LAN Standards, IEEE 802 standards, Channel Access Methods, Aloha, CSMA, CSMA/CD, Token Passing, Ethernet, Layer 2 & 3 switching, Fast Ethernet and Gigabit Ethernet, Token Ring, LAN interconnecting devices: Hubs, Switches, Bridges, Routers, Gateways.

**Wide Area Networks:** Introduction of WANs, Routing, Congestion Control, WAN Technologies, Distributed Queue Dual Bus (DQDB), Synchronous Digital Hierarchy (SDH)/ Synchronous Optical Network (SONET), Asynchronous Transfer Mode (ATM), Frame Relay, Wireless Links.

**UNIT-IV**

**Introduction to Network Management:** Remote Monitoring Techniques: Polling, Traps, Performance Management, Class of Service, Quality of Service, Security manageme nt, Firewalls, VLANs, Proxy Servers, Introduction to Network Operating Systems: Client-Serve r infrastructure, Windows NT/2000.

**COURSE OUTCOMES**

After taking the course, students will be able to:

1. Explain the functions of the different layer of the OSI Protocol.

2. Draw the functional block diagram of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs) describe the function of each block.

3. For a given requirement (small scale) of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs) design it based on the market available component

4. For a given problem related TCP/IP protocol developed the network programming.

5. Configure DNS DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls using open source available software and tools.

**Text Books/ Reference books:**

1. Computer Networks (3rd edition), Tanenbaum Andrew S., International edition, 1996.
2. Data Communications, Computer Networks and Open Systems (4th edition), Halsall Fred, 2000, Addison Wesley, Low Price Edition.
3. Business Data Communications, Fitzgerald Jerry.
4. Computer Networks – A System Approach, Larry L. Peterson & Bruce S. Davie, 2nd Edition
5. Computer Networking – ED Tittel , 2002, T.M.H

**Note: Latest and additional good books may be suggested and added from time to time.**

# BCA-DS-215: JAVA Programming LAB
## *BCA IV Semester*

| | | |
|---|---|---|
| No. of Credits: 2 | Sessional: | 25 Marks |
| L T    P    Total | Practical: | 50 Marks |
| 0 0    4    4 | Total : | 75 Marks |
| | Duration of Exam: | 3 Hours |

### List of Programs:

## 1. Basics of Java: Classes and objects (Data types, Operators, Array, String)

- Write a Java program that prints all real solutions to the quadratic equation $ax^2 + bx + c = 0$. Read in a, b, c and use the quadratic formula. If the discriminant $b^2 - 4ac$ is negative, display a message stating that there are no real solutions.

- Write a Java program that prompts the user for an integer and then prints out all prime numbers up to that integer.

- Write a Java program to multiply two given matrices.

- Write a Java Program that reads a line of integers, and then displays each integer, and the sum of all the integers (Use StringTokenizer class of java.util)

- Write a Java program that checks whether a given string is a palindrome or not. Ex: MADAM is a palindrome.

- Write a Java program for sorting a given list of names in ascending order.

- Write a Java program to make frequency count of words in a given text.

## 2. Object Oriented Concepts:

Programs on Inheritance, Method Overloading and Overriding, Abstract class and methods, Packages and interface (at least 7 programs)

## 3. Advanced Concepts:

Programs on Exception and Exception handling, Multithreading, (at least 4 programs).

## 4. File Handling:

- Write a Java program that reads a file name from the user, then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes.

- Write a Java program that reads a file and displays the file on the screen, with a line number before each line.

- Write a Java program that displays the number of characters, lines and words in a text file.

## 5. Applet and Event Handling:

- Develop an applet that displays a simple message.

- Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for digits and for the +, -, *, %
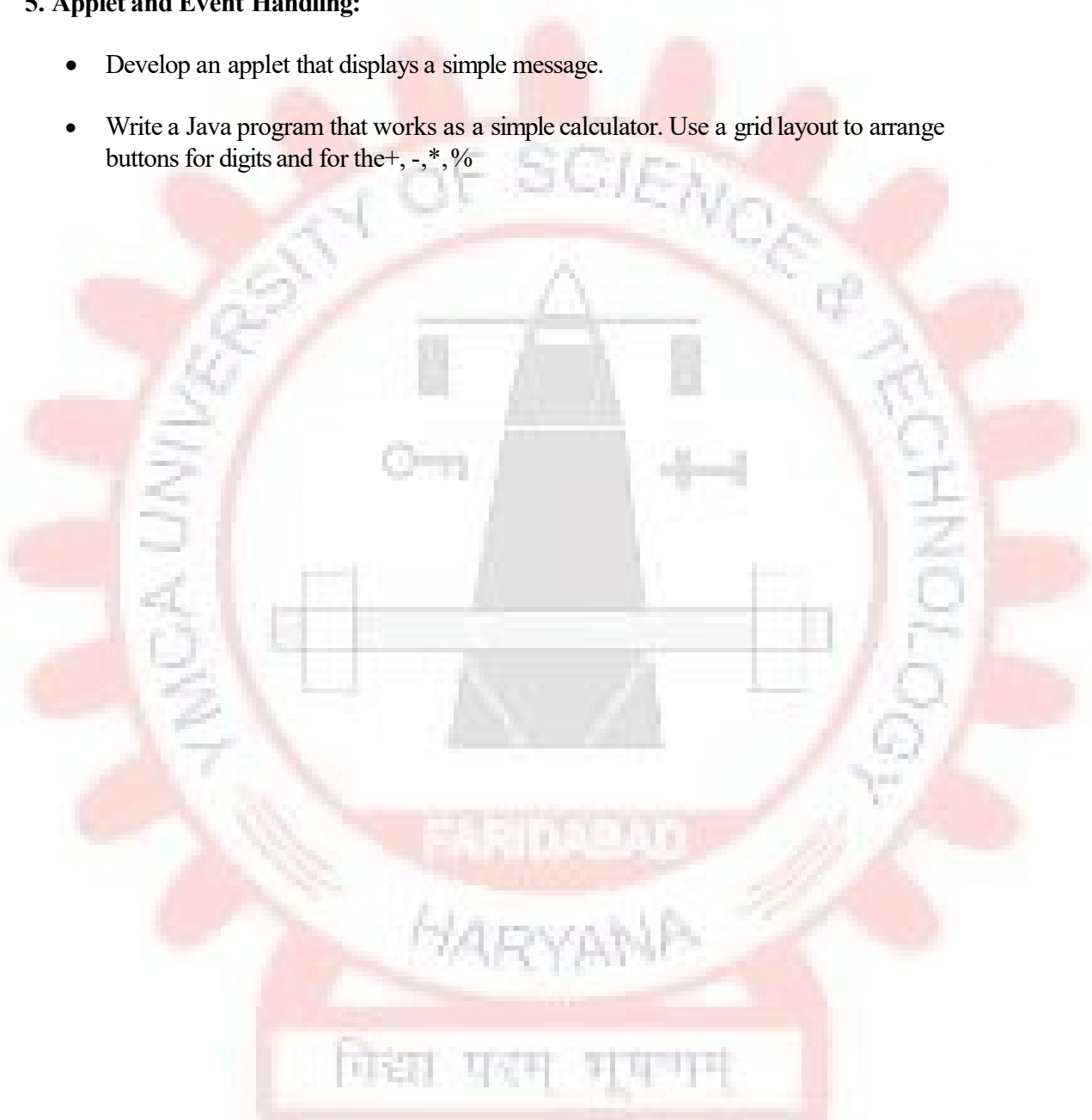
# BCA-DS-216: R Programming LAB
## *BCA IV Semester*

| | |
|---|---|
| No. of Credits: 2 | Sessional: 25 Marks |
| L T P Total | Practical: 50 Marks |
| 0 0 4 4 | Total : 75 Marks |
| | Duration of Exam: 3 Hours |

*List of Programs:*

1. **Programs related to the basics:**

   Write a program in R to take input from the user (name and age) and display the values. Also print the version of R installation.

   Write a program in R to create a sequence of numbers from 20 to 50 and find the mean of numbers from 20 to 60 and sum of numbers from 51 to 91.

   Write an R program to create a vector which contains 10 random integer values between -50 and +50.

   Write a program in R to find the factors of a given number.

   Write a program in R to find the maximum and the minimum value of a given vector.

2. **Programs related to the array:**

   Write a program in R to convert a given matrix to a 1 dimensional array.

   Write a program in R to create an array of two 3x3 matrices each with 3 rows and 3 columns from two given two vectors.

   Write a program in R to create an 3 dimensional array of 24 elements using the dim() function.

3. **Programs related to the Data Frame:**

   Write a program in R to create an empty data frame.

   Write a program in R to create a data frame from four given vectors.

   Write a program in R to get the structure of a given data frame.

   Write a program in R to get the statistical summary and nature of the data of a given data frame.

   Write a program in R to extract first two rows from a given data frame.

   Write a program in R to add new row(s) and column(s) to an existing data frame.

4. **Programs related to the matrix:**

   Write a program in R to create a matrix taking a given vector of numbers as input. Display the matrix.

   Write a program in R to access the element at $3^{rd}$ column and $2^{nd}$ row, only the $3^{rd}$ row and only the $4^{th}$ column of a given matrix.

   Write a program in R to create two 2x3 matrix and add, subtract, multiply and divide the matrixes.

**5. Programs related to the vectors:**

Write a program in R to create a vector of a specified type and length. Create vector of numeric, complex, logical and character types of length 6.

Write a program in R to add, multiply, divide two vectors of integers type and length 3.

**6. Programs related to the List:**

Write a program in R to create a list containing strings, numbers, vectors and a logical value.

Write a program in R to create a list containing a vector, a matrix and a list and give names to the elements in the list. Access the first and second element of the list.

Write a program in R to select second element of a given nested list.

**7. Write a program to Import and export file through ODBC.**