ITM(SLS) Baroda University,

B.Tech CSE/AI/IT/CS

Semester:1

Subject:R Programming for Data

Course Code: C21X0C3

Unit 10_11_12 and Programming exercises_Unit 1_Unit12 Question Bank

Unit 10	
Q.1	Explain various themes in ggplot2.
Q.2	List grammar of graphics used in ggplot2.
Q.3	Write various commands to set positions of legends.
Q.4	Explain various components of ggtheme.
Q.5	Describe element function in ggtheme.
Unit 11	
Q.1	Explain Select, From and Where functions in SQL Statements.
Q.2	Explain Is, Like and Order By functions with examples.
Q.3	Explain Limit, Min/Max functions in SQL Statements.
Q.4	Explain the use of special symbol in SQL Statement with examples : * , _ , %.
Unit 12	
Q.1	Write procedure to create Rmarkdown document.
Q.2	List down different types of documents that can be created with Rmarkdown.
Q.3	Explain Rmarkdown basics.
Q.4	Explain YAML headers of markdown document.

Unit 1 to 12 Programming Exercises	
Q.1	Write a R program to take input from the user (name and age) and display the values. Also print the version of R installation.
Q.2	Write a R program to create a sequence of numbers from 10 to 40 and find the mean of numbers from 10 to 30 and sum of numbers from 31 to 40.
Q.3	Write a R program to create a vector which contains 10 random integer values between -50 and +50.
Q.4	Write a R program to get the first 10 Fibonacci numbers.
Q.5	Write a R program to get all prime numbers up to a given number
Q.6	Write a R program to find the maximum and the minimum value of a given vector
Q.7	Write a R program to create three vectors of numeric data, character data and logical data. Display the content of the vectors and their type
Q.8	Write a R program to create a 5 x 4 matrix , 3 x 3 matrix with labels and fill the matrix by rows and 2 × 2 matrix with labels and fill the matrix by columns.
Q.9	Write a R program to create an array, passing in a vector of values and a vector of dimensions. Also provide names for each dimension.
Q.10	Write a R program to create a simple bar plot (histogram) of five subjects marks.
Q.11	Write a R program to find addition of all even numbers between 25 to 45.
Q.12	Write a R program to print all palindrome elements from a given vector.
Q.13	Write a R program to print all prime numbers from a given vector.
Q.14	Write a R program to implement user defined functions maxVector(vector1,vector2) that create a third vector that holds maximum value from both the input vectors. (Note: Assume the size of both vectors are size.) (i.e. Input : Vector1=(11,16,28,45), Vector2=(4,22,24,35), Output : Vector3=(11,22,28,45))

Q.15

1. Create the vectors:

(a) $(1, 2, 3, \ldots, 19, 20)$

(b) $(20, 19, \ldots, 2, 1)$

(c) $(1, 2, 3, \ldots, 19, 20, 19, 18, \ldots, 2, 1)$

(d) $(4, 6, 3)$ and assign it to the name `tmp`.

For parts (e), (f) and (g) look at the help for the function `rep`.

(e) $(4, 6, 3, 4, 6, 3, \ldots, 4, 6, 3)$ where there are 10 occurrences of 4.

(f) $(4, 6, 3, 4, 6, 3, \ldots, 4, 6, 3, 4)$ where there are 11 occurrences of 4, 10 occurrences of 6 and 10 occurrences of 3.

(g) $(4, 4, \ldots, 4, 6, 6, \ldots, 6, 3, 3, \ldots, 3)$ where there are 10 occurrences of 4, 20 occurrences of 6 and 30 occurrences of 3.

2. Create a vector of the values of $e^x \cos(x)$ at $x = 3, 3.1, 3.2, \ldots, 6$.

3. Create the following vectors:

(a) $(0.1^3 0.2^1, 0.1^6 0.2^4, \ldots, 0.1^{36} 0.2^{34})$ **(b)** $\left(2, \frac{2^2}{2}, \frac{2^3}{3}, \ldots, \frac{2^{25}}{25}\right)$

4. Calculate the following:

(a) $\sum_{i=10}^{100} (i^3 + 4i^2)$. **(b)** $\sum_{i=1}^{25} \left(\frac{2^i}{i} + \frac{3^i}{i^2}\right)$

5. Use the function `paste` to create the following character vectors of length 30:

(a) `("label 1", "label 2", ....., "label 30")`.
Note that there is a single space between `label` and the number following.

(b) `("fn1", "fn2", ..., "fn30")`.
In this case, there is no space between `fn` and the number following.

6. Execute the following lines which create two vectors of random integers which are chosen with replacement from the integers 0, 1, ..., 999. Both vectors have length 250.

```
set.seed(50)
xVec <- sample(0:999, 250, replace=T)
yVec <- sample(0:999, 250, replace=T)
```

Suppose $\mathbf{x} = (x_1, x_2, \ldots, x_n)$ denotes the vector `xVec` and $\mathbf{y} = (y_1, y_2, \ldots, y_n)$ denotes the vector `yVec`.

(a) Create the vector $(y_2 - x_1, \ldots, y_n - x_{n-1})$.

(b) Create the vector $\left(\frac{\sin(y_1)}{\cos(x_2)}, \frac{\sin(y_2)}{\cos(x_3)}, \ldots, \frac{\sin(y_{n-1})}{\cos(x_n)}\right)$.

(c) Create the vector $(x_1 + 2x_2 - x_3, x_2 + 2x_3 - x_4, \ldots, x_{n-2} + 2x_{n-1} - x_n)$.

1. Suppose

$$\mathbf{A} = \begin{bmatrix} 1 & 1 & 3 \\ 5 & 2 & 6 \\ -2 & -1 & -3 \end{bmatrix}$$

(a) Check that $\mathbf{A}^3 = \mathbf{0}$ where $\mathbf{0}$ is a 3×3 matrix with every entry equal to 0.

(b) Replace the third column of $\mathbf{A}$ by the sum of the second and third columns.

2. Create the following matrix $\mathbf{B}$ with 15 rows:

$$\mathbf{B} = \begin{bmatrix} 10 & -10 & 10 \\ 10 & -10 & 10 \\ \cdots & \cdots & \cdots \\ 10 & -10 & 10 \end{bmatrix}$$

Calculate the 3×3 matrix $\mathbf{B}^T\mathbf{B}$. (Look at the help for `crossprod`.)

3. Create a 6×6 matrix `matE` with every entry equal to 0. Check what the functions `row` and `col` return when applied to `matE`. Hence create the 6×6 matrix:

$$\begin{bmatrix} 0 & 1 & 0 & 0 & 0 & 0 \\ 1 & 0 & 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 0 & 1 & 0 \end{bmatrix}$$

4. Look at the help for the function `outer`. Hence create the following patterned matrix:

$$\begin{pmatrix} 0 & 1 & 2 & 3 & 4 \\ 1 & 2 & 3 & 4 & 5 \\ 2 & 3 & 4 & 5 & 6 \\ 3 & 4 & 5 & 6 & 7 \\ 4 & 5 & 6 & 7 & 8 \end{pmatrix}$$