RMT-103

Ph.D. IN MATHEMATICS (PHDMT)

Term-End Examination

December, 2022

RMT-103 : RESEARCH METHODOLOGY

Time : 3 hours *Maximum Marks : 100*

Note : *Q. No.* ***1*** *is* ***compulsory****. Attempt any* ***six*** *questions from Q. No. 2 to 8.*

1. State whether the following statements are *true* of *false*. Give reasons for your answers. *5×2=10*

(a) The table environment of LaTeX can be used inside a `tabular` environment.

(b) The LaTeX command to produce $\vec{a}$ is `\vec{a}`.

(c) The LaTeX command `\backslash` can also be used inside a text environment.

(d) The command `\usepackage{graphicx}` must be used if the LaTeX document contains some external graphics or pictures.

(e) The R command `matrix(1, 2, 3)` prints an array containing the entries 1, 2 and 3.

2. Differentiate between Qualitative and Quantitative research along with suitable examples in each of the aspects they differ. *15*

3. Write in detail about the essential components of a good research proposal. What are the factors affecting the research design ? *15*

4. Write a short note on each of the following along with suitable examples : *3×5=15*

(a) Copyright

(b) Research Report

(c) Secondary Data

5. (a) What does the following command in the beginning of a LaTeX file mean to produce ? *5*

```
\documentclass[10pt, twoside,
                fleqn, draft] {article}
```

(b) Describe the usual horizontal and vertical spacing commands available in LaTeX. *5*

(c) Describe how you would produce a box containing multiple paragraphs of text in LaTeX. *5*

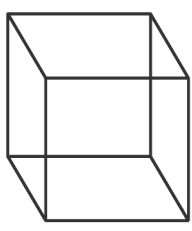
6. (a) Write LaTeX code for producing the following output : *7*

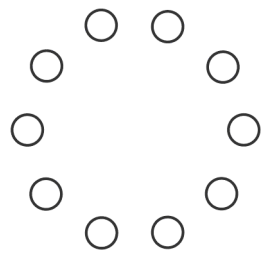
$$\begin{bmatrix} 1 & 0 & \frac{3}{4} \\ 2 & 2 & -1 \\ 3 & 1 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 1 \\ 4 \\ 2 \end{bmatrix}$$

(b) Write LaTeX code for producing the following output : *8*

$$\left| \int_a^b f(x)\, dx \right| \leq \int_a^b \left| f(x) \right| dx$$

7. Write LaTeX codes for drawing the following pictures using the `tikzpicture` environment. Also list the necessary packages or libraries, if any. *15*





8. (a) Write the output of the following R command : *5*

```
rep(seq(1, by=2, 8), each=2, times=3)
```

(b) The following data represents the highest percentage of marks obtained by the students in different classes of five schools :

	V	VIII	X	XII
GBS	90	78	90	85
DPS	89	90	94	91
AMITY	83	78	86	88
AMRITA	70	82	83	78
MIS	92	93	89	95

Use R command to store this data into a matrix called M. Assign the row and column names of M as given in the data. Then use the `apply()` function to compute the minimum, maximum and mean for each row, and also for each column. *10*