

Ph. D. IN MATHEMATICS (PHDMT)

Term-End Examination

December, 2024

RMT-103 : RESEARCH METHODOLOGY

Time : 3 Hours

Maximum Marks : 100

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

1. State whether the following statements are true or false. Give reasons for your answers : 10
 - (i) One of the options available in the L^AT_EX document class article is slides.
 - (ii) The align environment of L^AT_EX can be nested with \[... \].
 - (iii) The L^AT_EX command \GAMMA produces the Greek symbol Γ .
 - (iv) The R command list ("red", c (1, 2, 3), "IGNOU") prints a list of three items.
 - (v) The following R command prints 470 :

sum (matrix (1 : 20, 4, 5)

%%*% matrix (5 :1))

2. Explain the steps to be carried out in the research process with suitable examples. Also, explain the importance of each step. 15
3. Differentiate between primary sources and secondary sources with suitable examples. Also, list the merits and demerits of collecting of each of the sources. 15
4. Write short notes on the following along with suitable examples : 5×3=15
 - (i) Scientific Paper
 - (ii) Patent
 - (iii) Qualitative Research
5. (a) Write L^AT_EX code for producing the following boxed output : 5

$$\int_0^{\infty} f(x) dx \approx \sum_{i=1}^n w_i e^{x_i} f(x_i)$$

- (b) What do the following L^AT_EX commands produce ? 10

`\rceil`, `\langle`, `\updownarrow`, `\rbrace`,
`\lbrack`, `\nrightarrow`, `\prod`, `\cup`, `\sup`,
`\nleftarrow`
6. Explain the broad structure of a book class, with the help of the essential L^AT_EX commands. 15

7. Using the command `\newtheorem`, define a theorem environment. Then use this environment to type the following theorem : 15

Theorem 1 (Archimedean Property) : Let $x, y \in \mathbb{R}$ such that $0 < x < y$. Then there exists $n \in \mathbb{N}$ such that :

$$\underbrace{x + x + \dots + x}_{n \text{ times}} > y, \text{ that is, } nx > y.$$

8. Explain the following R functions with an example for each : 3×5=15

- (i) `apply()`
- (ii) `setdiff()`
- (iii) `scan()`
- (iv) `unique()`
- (v) `which()`

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