

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086
(For candidates admitted during the academic year 2019 – 20 & thereafter)

M.Sc. DEGREE EXAMINATION, November 2023
BRANCH I – MATHEMATICS
THIRD SEMESTER

COURSE : CORE
PAPER : RESEARCH METHODS AND TOOLS
SUBJECT CODE : 19MT/PC/RT34

TIME : 3 hours

MAXIMUM MARKS : 100

THEORY:

Answer *ANY TWO* questions ($2 \times 10 = 20$)

1. Discuss the key steps involved in formulating a research problem and its importance in the research process.
2. Write a note on the various methods involved in data collection.
3. List and explain the characteristics of a well-written research report.

PRACTICAL:

Section – A

Answer *ANY TWO* questions ($2 \times 20 = 40$)

1. Typeset the document given in page 3.
2. (a) Draw a complete graph of n vertices in TikZ.
(b) Create a 2D plot of a function $y = 2x^2 + 3x - 1$ using pgfplots. Also customize the plot with a title, axis labels and legend.
(c) Draw a mesh plot with 10 scatter points for the function $x(1 - x)y^2$ using pgfplots. (7+7+6)
3. Create a presentation using beamer involving the below mentioned features:
 - (a) Title Page
 - (b) Table of contents
 - (c) Sections
 - (d) Overlays
 - (e) Transition Effects
 - (f) Blocks
 - (g) Columns
 - (h) Different themes

Section – B

Answer **ANY TWO** questions ($2 \times 20 = 40$)

4. In MATLAB, create a 4×4 matrix and perform each of the following:
- (a) Maximum value in each column
 - (b) Minimum value in each row
 - (c) Sum of all the elements
 - (d) Characteristic polynomial
 - (e) Eigen values and Eigen vectors
 - (f) Elements greater than 5 using logical indexing
 - (g) Extract a submatrix
 - (h) Replace the second row with all 1's
5. (a) Obtain the product of two polynomials $2x^2 + 3x - 1$ and $4x^3 - x^2 + 6x + 2$ in MATLAB.
- (b) Write a MATLAB script that prompts the user to enter their name and age. Then, display a personalized greeting depending on their age.
- (c) Write a MATLAB script to create a basic calculator with at least 3 operations. The user should choose the operation to perform and then the parameters accordingly.

(5+7+8)

6. (a) A person spends his time on different activities daily (in hours):

Activity:	Office Work	Exercise	Travelling	Watching Shows	Sleeping	Misc.
Number of Hours spent:	9	1	2	3	7	2

Draw a pie chart and a horizontal bar diagram for this information in MATLAB.

- (b) Create a mesh and surface plot of the surface $\langle 2 \cos u \sin v, 2 \sin u \sin v, 2 \cos v \rangle$, $0 \leq u \leq 2\pi, 0 \leq v \leq \pi$ in Matlab.

(10+10)
