# LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

**M.Sc.** DEGREE EXAMINATION – **MATHEMATICS**

THIRD SEMESTER – **NOVEMBER 2023**

**PMT3ID01 – MATHEMATICAL COMPUTING USING MATLAB AND R**

Date: 09-11-2023 Dept. No. Max. : 100 Marks

Time: 01:00 PM - 04:00 PM

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| | **SECTION A – K1 (CO1)** |
| | **Answer ALL the questions** **(5 x 1 = 5)** |
| **1** | **Answer the following:** |
| a) | Write the syntax to import a csv file in R language. |
| b) | What is the use of length function in R? |
| c) | State the use of clear command in MATLAB. |
| d) | Define interpolation. |
| e) | Write the equivalent MATLAB command for the expression $\frac{d^2}{dx^2}(\tan x)$. |
| | **SECTION A – K2 (CO1)** |
| | **Answer ALL the questions** **(5 x 1 = 5)** |
| 2 | **Choose the correct answer:** |
| a) | The function _____ is used to invoke a spreadsheet style data viewer in R studio.<br>(i) view()<br>(ii) edit()<br>(iii) view()<br>(iv) edit() |
| b) | Which of these is a continuous graph?<br>(i) Bar diagram<br>(ii) Pie diagram<br>(iii) Histogram<br>(iv) Boxplot |
| c) | What command is used to control the spacing between the MATLAB command or expression and the result?<br>(i) ellipsis<br>(ii) clear<br>(iii) format<br>(iv) figure |
| d) | To see the submatrix with $a_{ij}$ for $2 \leq i \leq 4$ and $1 \leq j \leq 2$ of a matrix a, of order $5 \times 6$, which code is used?<br>(i) a(2;4,1:2)<br>(ii) a(2,4:1,2)<br>(iii) a(2,4;1,2)<br>(iv) a(2:4, 1:2) |

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| e) | In MATLAB, what will be the output of the following code?<br>syms x;<br>diff(sin(x)\x$^2$)<br>(i) cos(x)/x$^2$ – (2*sin(x))/x$^3$<br>(ii) x$^2$*cos(x) + 2*x*sin(x)<br>(iii) (2*x)/sin(x) – (x$^2$*cos(x))/sin$^2$(x)<br>(iv) Error |
| | **SECTION B – K3 (CO2)** |
| | **Answer any THREE of the following** **(3 x 10 = 30)** |
| 3 | Explain chi-square test with suitable example. |
| 4 | Explain the following functions with an illustration:<br>(i) prop.table() (ii) seq() (iii) rep() (iv) plot() (v) subset() |
| 5 | a. Describe the four windows of MATLAB desktop. (5 + 5)<br>b. Write MATLAB commands to evaluate the following mathematical expressions:<br>i. $y = 5x^4 + \frac{3}{x^2}$<br>ii. $y = 3\frac{\cos 3x}{7}$<br>iii. $y = 4x^{0.58} + \frac{1}{x^{0.72}}$<br>iv. $r = \frac{1}{\frac{1}{a}+\frac{1}{b}+\frac{1}{c}+\frac{1}{d}}$<br>v. $y = \sqrt{x^3 + 2x}$ |
| 6 | a. Explain how to utilize the MATLAB keywords fliplr, flipud, rot90 & repmat.<br>b. Write a brief essay about MATLAB output statements using relevant examples. (5 + 5) |
| 7 | Write down the description for the following commands:<br>i) grid ii) clf iii) hold iv) legend v) title |
| | **SECTION C – K4 (CO3)** |
| | **Answer any TWO of the following** **(2 x 12.5 = 25)** |
| 8 | a. Frame a data set and create new variables based on (i) a condition and (ii) multiple conditions.<br>b. Explain logical and relational operators in R with examples. (8 + 4.5) |
| 9 | Explain different types of correlations with examples. |
| 10 | How could one refer and modify an element or a group of elements in MATLAB? Make use of an array to explain. |
| 11 | a. Given a system Ax=b, where $A = \begin{bmatrix} 8 & 2 \\ 4 & 3 \end{bmatrix}$, $x = \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$, $b = \begin{bmatrix} 5 \\ 7 \end{bmatrix}$, write the equivalent MATLAB commands for the following:<br>i. rank of A<br>ii. upper triangular matrix of A<br>iii. trace of A<br>iv. determinant of A<br>v. inverse of A<br>b. Briefly describe several MATLAB 2D and 3D plots. (5 + 7.5) |

## SECTION D – K5 (CO4)

| | **Answer any ONE of the following** | **(1 x 15 = 15)** |
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| 12 | Explain various graphical techniques available for visualizing univariate and bivariate data. | |
| 13 | a. Explain the functions polyfit and polyval in MATLAB.<br>b. Briefly describe the For loop and the While loop using appropriate examples. (5 + 10) | |

## SECTION E – K6 (CO5)

| | **Answer any ONE of the following** | **(1 x 20 = 20)** |
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| 14 | a. The following table gives the intelligence scores (X) and productivity indices (Y) of 10 workers selected at random: | |

| X | 60 | 62 | 65 | 70 | 72 | 48 | 53 | 73 | 65 | 82 |
|---|---|---|---|---|---|---|---|---|---|---|
| Y | 68 | 60 | 62 | 80 | 85 | 40 | 52 | 62 | 60 | 81 |

Predict the productivity index of a worker whose test score is 92.

b. Construct two matrices and write the R code to perform matrix addition, subtraction, multiplication and inverse. (10 + 10)

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| 15 | a. Clarify the three basic different operations or modes on files in MATLAB with appropriate examples.<br>b. Construct a movie for sine function over the limit $-2\pi$ to $2\pi$ by writing a script file. (10 +10) | |

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