STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086
(For candidates admitted during the academic year 2019 – 2020 & thereafter)

B.Sc. DEGREE EXAMINATION, NOVEMBER 2023
BRANCH I – MATHEMATICS
FIFTH SEMESTER

COURSE   : INTERDISCIPLINARY CORE
PAPER   : MATHEMATICS THROUGH SCIENTIFIC SOFTWARE
SUBJECT CODE : 19ID/IC/MS55
TIME   : 3 HOURS   MAX.MARKS: 100

SECTION –A

ANSWER ALL THE QUESTIONS   **(20×1=20)**

1. In **MATHCAD**, the first row and first column of the matrix have index
   a) 1   c) 0
   b) 1,1   d) None of the above

2. In **MATHCAD** there are _____ regions
   a) two   c) three
   b) many   d) four

3. The following is a built–in function in **MATHCAD**
   a) Trigonometric calculations   c) Statistical Calculations
   b) Data Analysis   d) All of the above

4. In **MATHCAD**, descriptive text can be placed _____ inside the document.
   a) only in the beginning of the region c) anywhere
   b) after the math region   d) None of the above

5. In **R,** _____ divides the dataset into three quartiles.
   a) Bar chart   c) Pie chart
   b) Histogram   d) Box plot

6. In **R**, the height of the bars in a bar chart is proportional to the _____ they represent.
   a) names   c) values
   b) parameters   d) none of the above

7. In **R**, _____ represents data points that fit in only one of a finite number of distinct values.
   a) List   c) Factors
   b) Arrays   d) Matrices

8. In **R**, the _____ returns the conjugate of a complex number
   a) Conj()   c) conj()
   b) Conju()   d) conju()

9. The _____ is itself a quantile.
   a) Mean   c) Median
   b) Mode   d) Range

10. The _____ is a particular representation of the average squared distance of each observation when compared to the mean.
a) Standard deviation	c) Variance
b) Correlation	d) Quartiles

11. In *R*, for regression analysis, the _____ of the relationship model gives the average error in prediction.
a) plot	c) summary
b) predict	d) None of the above

12. In the function *dnorm(x, mean, sd)* the default value of *sd* is ___
a) Zero	c) Unity
b) sd of the sample	d) sd of the data

13. In Excel, _____ appears at the bottom of the Excel Window.
a) Title bar	c) Formula bar
b) Worksheet tabs	d) Name box

14. Which of the following is not a term pertaining to spreadsheets?
a) Cell	c) Character
b) Browser	d) Formula

15. In which tab wrap text feature is present in MS Excel.
a) Formula	c) View
b) Insert	d) Home

16. _____ tool helps better for What-If analysis in Excel.
a) Pivot Table	c) Track Change
b) Goal Seek	d) Formula Auditing

17. A _____ lets to hide/reveal parts of a layer.
a) Alpha Channel	c) Layer Mask
b) Layer Mask	d) Light & Shadow Filter

18. The image loses its quality by being _____
a) Merged	c) Scaled
b) Renamed	d) Masked

19. _____ tool takes color in passing and uses it to mix to the next color it meets.
a) Smudge	c) Patch
b) Heal	d) Dodge

20. _____ is the shortcut for Text tool.
a) T	c) Ctrl + T
b) Alt + T	d) Shift + T

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SECTION –B

ANSWER ANY FOUR QUESTIONS   **(4×20=80)**

1. Compute the following in MATHCAD

   a) Draw the multiple polar curve for $r = \frac{1}{2} + \cos(t)$ and $r = \sin(t)$.   **(5 marks)**

   b) Solve the given system of linear equations   **(5 marks)**
   $$x + y + z = 6$$
   $$3x + 3y + 4z = 20$$
   $$2x + y + 3z = 13$$

   c) Create two numeric matrices of order $3 \times 3,$ find their element wise product and the matrix multiplication of the two matrices.   **(4 marks)**

   d) From the matrix $A = \begin{pmatrix} 3 & 4 & 2 \\ 2 & 5 & -2 \\ 3 & 2 & 7 \end{pmatrix}$, create a submatrix using only the first two rows and last two columns.   **(2 marks)**

   e) Define the range of a as 10 to 50 in intervals of 10 and hence compute $a + a^3$ and $\cos a$.   **(4 marks)**

2. a) Draw a vertical bar chart representing the following data – "Production of Rice in Tamil Nadu", label the axis and use colors for the bar chart.   **(5 marks)**

Year	Production (in tons)
1980	300
1990	450
2000	500
2010	525
2020	670

   b) Draw a pie chart with title, using rainbow color pallet and a key to represent the following data and label the data in the pie chart with their percentages. **(8 marks)**

Crime Cases registered in the districts in Tamil Nadu in 2022	
Trichy	2002
Chennai	5023
Madurai	3015
Erode	1025
Kanyakumari	4012

…2

c) In **R**, create and store a three-dimensional array with six layers of a 4 × 2 matrix, filled with a decreasing sequence of values between 4.8 and 0.1 of the appropriate length, extract and store as a new object the fourth and first row elements, in that order, of the second column only of all layers of the created array.   **(7 marks)**

3. a) Consider any data set from the **R** environment, use multiple regression with one response variable and four predictor variables, create a relationship model, get the summary of the relationship model and predict the value. Represent the above graphically.   **(15 marks)**

   b) Create a sequence and illustrate the application of $dnorm()$ and $pnorm()$ in **R**.
                                                                                    (5 marks)

4. Create an excel sheet that contains 10 customer record with the data fields:
   Customer No, Name, Vegetable, Price, Kilogram, Subtotal, Discount, Netamount.
                                                                                    (10 marks)

   Select Vegetable from the list (Carrot, Brinjal, Potato, Tomato).
   If the vegetable is Carrot, price = Rs.30/kg.
                        Brinjal, price = Rs.20/kg.
                        Potato   price = Rs.25/kg.
                        Tomato price = Rs.10/kg.
   The user should have not chosen more than 30 kg for each vegetable category.
                                                                                    (10 marks)

   a) Calculate Subtotal = Price * Kilogram.
   b) If the Subtotal is above 300, give 1% discount.
   c) Calculate Netamount = Subtotal – Discount.
   d) Sort the records based on max value of Netamount.

5. a) Apply illustration for the following given image.   **(10 marks)**

   b) Create Text mask to display "NATURE" using the image given   **(10 marks)**

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