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

B.Sc. DEGREE EXAMINATION, NOVEMBER 2024
BRANCH I – MATHEMATICS
FIFTH SEMESTER

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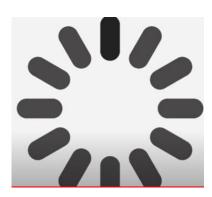PAPER   : MATHEMATICS THROUGH SCIENTIFIC SOFTWARE
SUBJECT CODE : 19ID/IC/MS55
TIME   : 3 HOURS   **MAX.MARKS: 100**

SECTION – A

ANSWER ALL THE QUESTIONS: **20 × 1 = 20**

1. How to remove borders applied in cells?
   a) Select None on Border tab of Format cells
   b) Open the list on Border tool in Format Cell toolbar then choose first tool (none)
   c) Both of the above
   d) None of the above
2. _____ is the correct syntax of IF() Function.
   a) =IF (logical_test, TRUE([value_if_true]), FALSE([value_if_false]))
   b) =IF (logical_test, [value_if_true], [value_if_false])
   c) =IF (logical_test, {[value_if_true]}, {[value_if_false]})
   d) =IF (logical_test: [value_if_true], [value_if_false])
3. _____ type of chart is good for a single series of data.
   a) Column chart   b) Cone chart   c) Line chart   d) Pie chart
4. _____ Excel function returns TRUE or FALSE based on two or more conditions
   a) =AVERAGEIFS   b) =CONCAT   c) =COUNTA   d) =AND
5. Why is the =COUNTIF function in Excel used?
   a) Counts cells as specified
   b) Counts blank cells in a range
   c) Counts cells with numbers in a range
   d) Returns values based on a TRUE or FALSE condition
6. HSB stands for?
   a) Hue, Saturation, Black   b) Hue, Saturation, Brightness
   c) Highlight, Softness, Brightness   d) None of the above

7. GIMP Animations will be saved as _____
   a) .png   b) .gif   c) .mov   d) .og
8. _____ are transparent sheets stacked one on top of the other.
   a) Layers   b) Canvas   c) Windows   d) None of these
9. By default the extension of Gimp file is _____ ?
   a) .XCf   b) .BMP   c) .TIFF   d) .PNG
10. To create the mirror image which tool is used ?
   a) Flip   b) Pencil   c) Scale   d) Move
11. In Mathcad, to assign certain values to a variable we use the _____ operator.
   Logical   b) Assignment   c) Numerical   d) string

12. In Mathcad, the vector length of a column matrix A can be obtained by _____.
   a) length (A)   b) $\overrightarrow{A^2}$ c) $|A|$ d) A^2

13. Which of the following symbol are used for square root of a variable.
   a) \   b) /   c) | d) ^

14. In Mathcad, to obtain the equivalent Greek letter for an English alphabet click _____.
   a) Shift +G   b) Ctrl+G   c) Shift + L   d) Ctrl+ L

15. We can create as well as convert a value into an integer type in R-programming using the _____ function.
   a) as.integer( )   b) typeof( )   c) class( )   d) is.integer( )

16. The output of the code >$class(9L)$ is _____.
   a) Numeric   b) integer   c) complex   d) logical

17. The parameter typeof ( ) is used to identify the data type in R-programming (True/ False)_____.

18. The function which gives the height of the probability distribution at each point for a given mean and standard standard deviation is _____.
   a) pnorm   b) hnorm   c) dnorm   d) qnorm

19. $0.7 \leq r \leq 1$ refers to a _____ between the 2 variables.
   a) no relationship   b) perfect positive linear relationship
   c) positive linear relationship   d) strong positive linear relationship

20. _____ is a better measure when the data is skewed.
   a) Mean   b) Median   c) Mode   d) Variance

SECTION – B
Answer any *FOUR* questions   **4 × 20 = 80**

21 The following worksheet contains Name & Taxable Income for 20 employees.   Calculate Income Tax Surcharge and Total Tax for the following

	A	B	C	D	E
1	NAME	TAXABLE INCOME	INCOME TAX	SURCHARGE ID	TOTAL TAX
2					
3					
---…					
20					

Income Tax is calculated as follows :

Taxable Income	Income tax
1,50,000	Nil
2,50,000	10%
3,25,000	20%
Excess	30%

Surcharge is 3% on Income Tax if Taxable income is above 5,00,000

a) Construct 3D Pie Chart for Total Tax
b) Construct 2D Line Chart for Taxable income and Surcharge
c) Data validation should be set for Taxable income and Surcharge to allow only whole numbers.   (20 marks)

22. Create a loading animation as the image given below using Gimp.

23. Using Mathcad, solve the following problems:
    (a) Evaluate $\iint xy\, dx\, dy$ taken over the positive quadrant of the circle $x^2 + y^2 = a^2$. (b) Find the determinant, inverse, eigen values and eigen vectors of the matrix
    $$\begin{bmatrix} -9 & 4 & 4 \\ -8 & 3 & 4 \\ -16 & 8 & 7 \end{bmatrix}.$$
    (c) Plot $f(x) = cos^2 x$ between the limits $-\pi$ and π.

    (7+8+5)

24. (a) Using R-programming, create and store a vector of the following values as objects in your workspace: 4, 5, 15, 58, 09, 7, 8, 7, 36, 45, 100, 7, 22, 7, 20. Identify the following:
    (i)   Those equal to 7
    (ii) Those greater than or equal to 20
    (iii) Find the number of vectors created
    (iv) Find the product of all the elements of the given vector.   **(8 marks)**
    (b) In R programming, create a data frame that stores the employee information of 8 employees of a company such as Employee ID, Name, Salary (ranging from 1000 to 10000) and Department. In this, include a new information of age of all employees. Also, extract the names of those employees whose salary is above 2000.   **(8 marks)**
    (c) In R, create a pie chart that shows the marks obtained by a student in an examination

Subject	Mathematics	Science	Tamil	English	Social science
Marks	66	99	88	72	55

(4 marks)

25.   (a) Using Gimp tools perform text mask on the given image. Give the text as "FOREST".

 (b) Create a sequence of numbers between -10 and 10 incrementing by 0.2 by choosing the mean as 2.5 and standard deviation as 2. Give the chart a file name and plot the graph.
(c) Consider the dataset PlantGrowth available in R for performing one-way ANOVA using R. Check if the hypothesis that the control group / treatment has effect on the plant weight / plant growth is true.

                                                                    (10+5+5)

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