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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. HSB stands for?
   a) Hue, Saturation, Black b) Hue, Saturation, Brightness
   c) Highlight, Softness, Brightness d) None of the above
2. GIMP Animations will be saved as _____
   a) .png b) .gif c) .mov d) .og
3. _____ are transparent sheets stacked one on top of the other.
   a) Layers b) Canvas c) Windows d) None of these
4. By default the extension of Gimp file is _____ ?
   a) .XCf b) .BMP c) .TIFF d) .PNG
5. To create the mirror image which tool is used ?
   a) Flip b) Pencil c) Scale d) Move
6. 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
7. ____ 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])
8. ____ type of chart is good for a single series of data.
   a) Column chart b) Cone chart c) Line chart d) Pie chart
9. _____ Excel function returns TRUE or FALSE based on two or more conditions
   a) =AVERAGEIFS b) =CONCAT c) =COUNTA d) =AND
10. 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
11. The output of the code *>class(9L)* is _____.
    a) Numeric b) integer c) complex d) logical
12. The parameter typeof ( ) is used to identify the data type in R-programming (True/ False)_____.
13. 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

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14. $0.7 \leq r \leq 1$ refers to a _____ between the 2 variables.
    a) no relationship b) perfect positive linear relationship
    c) positive linear relationship d) strong positive linear relationship
15. _____ is a better measure when the data is skewed.
    a) Mean b) Median c) Mode d) Variance
16. In Mathcad, to assign certain values to a variable we use the _____operator.
    Logical b) Assignment c) Numerical d) string
17. 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
18. Which of the following symbol are used for square root of a variable.
    a) \ b) / c) | d) ^
19. 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

20. 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( )

SECTION – B

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

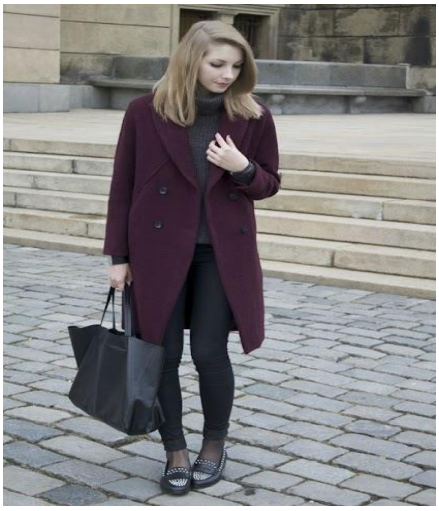
21. A worksheet contains Roll Number , Marks in 2 subjects for 20 students in a class. Calculate Result and Grade using the following:
    A student is declared as PASS if he gets 40 or more in both the subjects , Otherwise FAIL.
    All FAILED students will be given Grade IV
    For PASSED students Grade will be obtained as follows :

AVERAGE	GRADE
>=60	I
<60 but >=5	II
<50 but >=40	III

	A	B	C	D	E	F
1	ROLL	SUB 1	SUB 2	AVERAGE	RESULT	GRADE
2						
3						
…						
20						

    a) Construct 3D Pie Chart for Average
    b) Construct 2D Line Chart for Subject 1 and Subject 2
    c) Data validation should be set for Sub1 and Sub2 to allow only whole numbers.
    (20 marks)

22.Convert the given image into an illustration using Gimp tools.



23. Using Mathcad, solve the following problems

(a) Evaluate $\int \int_R (x-y)^4 e^{x+y}\, dx\, dy$, where *R* is the square with vertices $(1,0), (2,1), (1,2)$ and $(0,1)$.

(b) Verify Cayley Hamilton theorem for $A = \begin{pmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{pmatrix}$ and also find its inverse.

(c) Plot $f(x) = cos^2 x$ between the limits $-\pi$ and π.

(8+7+5)

24. (a) Using R-programming:

(i) Create a 3×3 matrix with the following elements filled row wise: 4, 5, 15, 58, 09, 7, 8, 7, 36

(ii) Overwrite the second column of the matrix from with that same column sorted from largest to smallest

(iii) Replace the main diagonal elements with 0

(iv) Extract the element from the second row and third column.

(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) Use the data set "mtcars" available in the R environment to create a basic boxplot that gives the relation between mpg (miles per gallon) and cyl (number of cylinders).

(4 marks)

25. (a) Using Gimp tools perform the color splash for the given image.

(b) Plot the scatter diagram and compute the correlation coefficient between the amount of fertilizer and the yield of onions for the following data:

Amount (X)	0	4	8	12
Yield (Y)	8.34	8.89	9.16	9.50

(c) Consider the dataset *mtcars* available in R. Perform ANOVA using R and check if the interaction between the horse power "hp" and transmission type "am" are significant?

(10+5+5)

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