Reg. No. : ....

Name : ....

I Semester B.Sc. Degree (CBCSS – OBE – Regular/Supplementary/Improvement) Examination, November 2023
(2019 Admission Onwards)
Complementary Elective Course in Mathematics
1C01 MAT-CS : MATHEMATICS FOR COMPUTER SCIENCE – I

Time : 3 Hours

Max. Marks : 40

PART – A

Answer **any 4** questions from this Part. **Each** question carries **1** mark.   (4×1=4)

1. Find the derivative of sec x.

2. Find $D^n (\sin ax + b)$.

3. Give an example of a system of linear homogeneous equations in three variables. Also discuss its solutions.

4. Define an orthogonal transformation and illustrate with an example.

5. State Langrange's mean value theorem.

PART – B

Answer **any 7** questions from this Part. **Each** question carries **2** marks.   (7×2=14)

6. Find the derivative of $(\cos x)^{\log x}$.

7. State Leibnitz's theorem for the nth derivative of product of two functions.

8. State and prove Cauchy's mean value theorem.

9. Verify Rolle's theorem for the function $f(x) = \dfrac{\sin x}{e^x}$ in the interval $[0, \pi]$.

P.T.O.

10. Evaluate $\lim_{x \to 0} \dfrac{\tan x - x}{x^2 \tan x}$.

11. Using Taylor's series, evaluate $\log_e 1.1$ correct to 4 decimal places.

12. Determine the rank of the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 1 & 4 \\ 3 & 0 & 5 \end{bmatrix}$.

13. Are the vectors (1, 3, 4, 2), (3, –5, 2, 2), (2, –1, 3, 2) linearly dependent ? If so find the relation between them.

14. Test the consistency of the system of equation $4x - 2y + 6z = 8$, $x + y - 3z = -1$, $15x - 3y + 9z = 21$.

15. Define an orthogonal matrix. Show that a matrix A is orthogonal, then the determinant of A is either 1 or –1.

PART – C

Answer **any 4** questions from this Part. **Each** question carries **3** marks. (4×3=12)

16. If $ax^2 + 2hxy + by^2 = 1$, then find $\dfrac{d^2y}{dx^2}$.

17. i) Show that $D^n(a^{mx}) = m^n (\log a)^n . a^{mx}$

    ii) Show that $D^n(ax + b)^m = m(m - 1)(m - 2) \ldots (m - n + 1)a^n (ax + b)^{m-n}$.

18. Using Maclaurin's series, expand $e^{\sin x}$ up to the term containing x^4.

19. Using Taylor's theorem expand $\tan^{-1} x$ in powers of $(x - 1)$ upto four terms.

20. Use Gauss-Jordan method, find the inverse of the matrix $\begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$.

21. Using partition method, find the inverse of the matrix

$$\begin{bmatrix} 1 & 1 & 1 \\ 4 & 3 & -1 \\ 3 & 5 & 3 \end{bmatrix}.$$

22. Write the working procedure to fit the parabola $y = a + bx + cx^2$ from a given data.

PART – D

Answer **any 2** questions from this Part. **Each** question carries **5** marks. (2×5=10)

23. Find the nth derivative of the following :

   a) $e^{2x} \cos^2 x \sin x$

   b) $e^{-3x} \cos^3 x.$

24. i) Evaluate $\lim_{x \to 0} \dfrac{e^x \sin x - x - x^2}{x^2 + x\log(1-x)}.$

   ii) Evaluate $\lim_{x \to 0} \left(\dfrac{\tan x}{x} \right)^{\frac{1}{x^2}}.$

25. i) Show that the equations $3x + 4y + 5z = a$, $4x + 5y + 6z = b$, $5x + 6y + 7z = c$ do not have a solution unless $a + c = 2b$.

   ii) Write the procedure to test the consistency of a system of equations in n unknowns.

26. Fit a second degree parabola to the following data

x = 1.0	1.5	2.0	2.5	3.0	3.5	4
y = 1.1	1.3	1.6	2.0	2.7	3.4	4.1

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