

VISWAJYOTHI COLLEGE OF ENGINEERING AND TECHNOLOGY (Autonomous)
FIRST SEMESTER B.TECH DEGREE EXAMINATION DECEMBER 2025 (2025 SCHEME)

Course Code: 25VJGAMAT101

Course Name: MATHEMATICS FOR INFORMATION SCIENCE-1

Max. Marks: 60

Duration: 2 Hours 30 Minutes

PART A

<i>Q.No.</i>	<i>Answer all questions. Each question carries 3 marks</i>	<i>CO</i>	<i>Marks</i>
1	At what points the function $f(x) = \sqrt{x^2 - 25}$ is continuous?	CO1	3
2	Find $\lim_{x \rightarrow 5} \frac{x-5}{x^2-25}$.	CO1	3
3	Find the first order partial derivatives of $f(x, y, z) = \ln(x + 2y + 3z)$.	CO2	3
4	Find $\lim_{(x,y) \rightarrow (0,0)} \frac{\cos(x^2+y^2)}{x+y+1}$.	CO2	3
5	Find the gradient of $f(x, y) = x^2 + y^2$ at $(1, 1)$.	CO3	3
6	Find the critical points of the function $f(x, y) = x^2 + xy + 3x + 2y$.	CO3	3
7	Solve graphically the LPP Maximize $Z = 3x_1 + 4x_2$ subject to $x_1 + x_2 \leq 4$, $x_1 \leq 2$, $x_1, x_2 \geq 0$.	CO4	3
8	Minimize the function $f(x, y) = x^2 + y^2$ with starting point $(1, 1)$ with step size, $\alpha = 0.1$ in for two iterations by the method of steepest descent.	CO4	3

PART B

Answer any one full question from each module. Each question carries 9 marks

Module 1

9 a.	Find the first and second order derivatives of $f(x) = \frac{x^3+1}{x}$.	CO1	3
b.	Determine the concavity of $f(x) = \ln x$ for $x > 0$.	CO1	6
10 a.	Use chain rule to find the derivative of $y = \sin(x^3 + x)$.	CO1	3
b.	Find the equations of the tangent and normal lines to the curve $x^3 + y^3 - xy = 1$ at the point $(1, 1)$.	CO1	6

Module 2

11 a.	Check the continuity of $f(x, y) = \begin{cases} \frac{2xy^2}{x^2 + 3y^4}, & (x, y) \neq (0, 0) \\ 0, & (x, y) = (0, 0) \end{cases}$.	CO2	6
b.	What are the level curves of the function $f(x, y) = x + y$, $C = 1, 2, 3$.	CO2	3
12 a.	If $f(x, y) = e^x \sin y$, show that the function satisfies Laplace equation $f_{xx} + f_{yy} = 0$.	CO2	3
b.	Use chain rule to find $\frac{\partial w}{\partial r}$ and $\frac{\partial w}{\partial s}$ where $w = x^2 + y^2$, $x = r - s$, $y = r + s$.	CO2	6

Module 3

- 13 Find the absolute extrema of $f(x, y) = 2 + 2x + 2y - x^2 - y^2$ on the triangular region in the first quadrant bounded by the lines $x = 0$, $y = 0$ and $y = 9 - x$. CO3 9
- 14 a. If $w = e^{xyz}$, $x = 3u + v$, $y = 3u - v$, $z = u^2v$, find $\frac{\partial w}{\partial u}$ and $\frac{\partial w}{\partial v}$. CO3 5
- b. Find the directional derivative of $f(x, y) = \sqrt{x^2 + y^2}$ at $(3, 4)$ in the direction of the vector $\bar{v} = 4i - 3j$. CO3 4

Module 4

- 15 Use the method of Lagrange's multipliers to find the maximum value of $f(x, y) = x + y$ subject to the constraint $x^2 + 4y^2 = 4$. CO4 9
- 16 a. A diet requires atleast 50 units of protien and 30 units of viitamins.
Food A has 10 units of protien and 5 units of vitamins.
Food B has 5 units of protien and 10 units of vitamins.
Formulate LPP to minimise food consumptions. CO4 3
- b. Solve graphically the LPP; Maximize $Z = 7x_1 + 2x_2$ subject to
 $x_1 + x_2 \leq 6$, $2x_1 + x_2 \leq 8$, $x_1, x_2 \geq 0$. CO4 6
