SRI SATHYA SAI INSTITUTE OF HIGHER LEARNING

(Deemed to be University)

Department of Mathematics and Computer Science

CIE - I

Topics: Mathematical Review & Unconstrained Optimization

UMAT-503: Optimization Techniques	Instructor: Dr. D Bhanu Prakash	Date: 08-08-2026

Q1. Using Newton's method, find the minimizer of $f(x) = 0.5x^2 - \sin x$, $x^{(0)} = 0.5$. The required accuracy is $\epsilon = 0.1$. *[Marks: 4 | BTL-4]*

Q2. State and prove the second order necessary condition to find the local minima of a set constrained optimization problem *[Marks: 2+4 | BTL-3]*

Q3. For the vector-valued function $F(x_1, x_2) = (x_1^2 x_2, x_1 + x_2^2, \sin(x_1 x_2))$, compute the derivative (Jacobian) matrix and evaluate it at the point (1, 0). *[Marks: 5 | BTL-3]*

Q4. For f(x, y) = x³ + y³ − 3xy, find all critical points. Using the first-order necessary condition and the second-order (Hessian) sufficient condition, classify each critical point as a local minimizer, local maximizer, or saddle point. *[Marks: 5 | BTL-4]*

— End of Question Paper —