

Mahindra University Hyderabad

École Centrale School of Engineering

Minor I

Program: B.Tech. Branch: Computation & Mathematics Year: Second Semester: Spring

Subject: Optimization Techniques (MA 2210)

Date: 29/02/2024

Start Time: 10:00 AM

Time Duration: 1.5 Hours

Max. Marks: 20

Instructions:

- 1) All questions are compulsory and consist of five marks.
 - 2) Please start each answer on a separate page and ensure you clearly number the responses. Also, make sure to address all parts of each question together and in the correct order.
 - 3) It is essential to provide an explanation of each step. Correct outcomes without any description will not be evaluated.
 - 4) A calculator is allowed.
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Q 01: Find the intervals of convexity and concavity of the function $f(x) = \sqrt{2 + x^2}$.

Q 02: Find the stationary points of the following multivariable function along with their values $f(x, y)$ corresponding to extreme points. Categorize these extreme points as positive definite or positive semi-definite, negative definite or negative semi-definite, or indefinite.

$$f(x, y) = x^3 + y^3 + 2x^2 + 4y^2 + 6$$

Q 03: Apply the Golden section method to find the value of x that minimizes the function $f(x) = (x - 4)^2$ in the range $[2, 5]$ with the given $\epsilon = 0.001$. Perform the procedure for three iterations. Also, give the number of iterations required to obtain the desirable accuracy.

Q 04: Find the solution to the following problem using the Lagrange multiplier method:

$$\max f(x, y, z) = x + z;$$

$$\text{subject to } g(x, y, z) = x^2 + y^2 + z^2 = 1.$$