# National University of Computer and Emerging Sciences, Lahore Campus

| | | | | |
|---|---|---|---|---|
| Course Name: | Calculus and Analytical Geometry | Course Code: | MT 1003 | |
| Degree Program: | BS (CS, DS, SE) | Semester: | Fall 2021 | |
| Exam Duration: | 60 Minutes | Total Marks: | 40 | |
| Paper Date: | 03-12-21 | Weight | 12.5 | |
| Section: | ALL | Page(s): | | |
| Exam Type: | Midterm-II | | | |

Student : Name:_____ Roll No._____ Section._____

Instruction/Notes: Attempt all questions. Programmable calculators are not allowed.

**Question 1[CLO-4, 5]:** For the given function, **[20 points]**

$$f(x) = 4x^3 - x^4$$

find

a) critical points of $f$ , if any, and identify the function' s behavior at each one
b) intervals where the curve is decreasing and where it is increasing
c) the points of inflection, if any occur, and determine the concavity of the curve.

**Question 2[CLO-5]** You are designing a rectangular poster to contain 50 $in^2$ of printing with a 4-$in.$ margin at the top and the bottom and 2-$in.$ margin at each side. What overall dimension will minimize the amount of paper used? **[10 points]**

**Question 3[CLO-6]**

a) Evaluate the integral given below **[5 points]**

$$\int \frac{1}{x^3}\sqrt{\frac{x^2-1}{x^2}}\,dx$$

b) Find the total area between the region and x-axis. **[5 points]**

$$y = x^3 - 3x^2 + 2x, \quad 0 \le x \le 2$$