National University of Computer and Emerging Sciences
Lahore Campus

0043

Multivariable Calculus (MT2008)

Sessional-I Exam

Date: 21 September 2024

Course Instructor
Muhammad Yaseen

Total Time (Hrs):	1
Total Marks:	30
Total Questions:	3

Roll No _____ Section _____ Student Signature _____

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Attempt all the questions.

CLO #1.

Q1: Use traces to sketch the quadric surface with equation [6 marks]

$$x^2 + 2z^2 - 6x - y + 10 = 0$$

9+1 Elliptic paraboloid

CLO #2.

Q2: (a). Determine whether the given function is continuous or discontinues. [4 marks]

$$g(x) = \begin{cases} (x^2 - y^2)/(x^2 + y^2) & if \quad (x,y) \neq 0 \\ 0 & if \quad (x,y) = 0 \end{cases}$$

(b). The total resistance R produced by three conductors with resistances R_1, R_2, R_3 connected in a parallel electrical circuit is given by the formula [4 marks]

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

Find $\partial R/\partial R_1$.

$\left(\frac{\partial R}{\partial R_1}\right)^2$

(c). If $z = f(r, \theta)$, where $r = xcosy$ and $\theta = xsiny$, show that [8 marks]

$$\frac{\partial^2 z}{\partial r^2} + \frac{\partial^2 z}{\partial \theta^2} = \frac{\partial^2 z}{\partial x^2} + \frac{1}{x^2}\frac{\partial^2 z}{\partial y^2} + \frac{1}{x}\frac{\partial z}{\partial x}$$

CLO #3.

Q3: Find the curvature of the twisted cubic $r(t) = < t, t^2, t^3 >$ at point$(0, 0, 0)$. [8 marks]

$$r(t) = \frac{|r'(t) \times r''(t)|}{|r'(t)|^3}$$

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