Bahria University, Islamabad Campus
Department of Computer Science
Final Term Examination
Class & Section: BS(CS)-3(A, B) Morning
(Spring 2023 Semester)
Paper Type: Descriptive

Course:	**Multivariable Calculus**	Date: **03-07-2023**
Course Code:	GSC-211	Session: **I**
Faculty's Name:	Ali Raza	Max Marks: 50
Time Allowed:	2.5 Hours	Total Pages: (02)

INSTRUCTIONS:

1. This is closed book exam. Communication devices and any written material is strictly prohibited.
2. All questions are compulsory.
3. There is a total of FIVE questions.
4. Return the question paper with answer book.

Student's Name: _____ Enroll No: _____
(USE CAPITAL LETTERS)

Question # 1 (05+05 Marks) (CLO-1)

Find all the local maxima, local minima, and saddle points of the following functions:

A. $f(x,y) = 4xy - x^4 - y^4$.

B. $f(x,y) = e^{2x}cosy$.

Question # 2 (06 Marks) (CLO-1)

Find the derivative of the function $h(x,y,z) = 3e^x \cos(yz)$ at $P_0(0,0,0)$ in the direction of $A = \hat{2\imath} + \hat{\jmath} - 2\hat{k}$.

Question # 3 (06+06 Marks) (CLO-2)

A. **Rectangle** $f(x,y) = 1/(xy)$ over the rectangular region $0 \le x \le \pi, 0 \le y \le 1$.

B. Find the average value of $F(x,y,z) = xyz$ over the cube in the first octant bounded by the coordinate planes and the planes $x = 2, y = 2,$ and $z = 2$.

(P.T.O.)

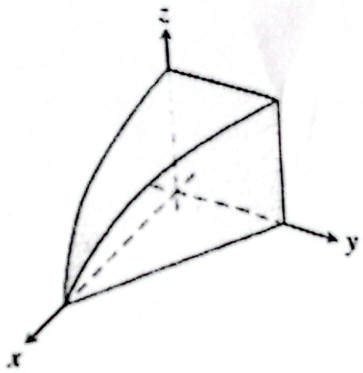
Enrollment Number: _____

Question # 4 (08 Marks) (CLO-3)

Evaluate $\int_0^{\ln 2} \int_0^{\sqrt{(\ln 2)^2 - y^2}} e^{\sqrt{x^2+y^2}}\, dxdy$, by changing the given Cartesian integral into an equivalent polar integral.

Question # 5 (07+07 Marks) (CLO-3)

A. The region in the first octant bounded by the coordinate planes, the plane $y = 1 - x$, and the surface $z = \cos\left(\frac{\pi x}{2}\right)$, $0 \le x \le 1$. Evaluate the following integral:



$$\iiint_D dzdydx$$

B. Evaluate the following spherical coordinate integral:

$$\int_0^{2\pi} \int_0^{\pi/3} \int_{\sec\phi}^{2} (3\rho^2 \sin\phi) d\rho d\phi d\theta$$

Best of Luck