IQRA UNIVERSITY IU

FACULTY OF ENGINEERING SCIENCES AND TECHNOLOGY

Department: **Computer Science** Program: **BS**

Multivariate Calculus

Announced date: 13-09-24 Due Date: 18-09-24 Total Marks = 05

Assignment 3			
Mapped CLO	**SDG**	**Knowledge Profile**	**Complex Problem Solving Mapped**
CLO3	4	WK2 (Mathematics)	GA – 2 (Knowledge for Solving Computing Problems)

Problem Statement:

Question # 01

a) Illustrate the region of integration

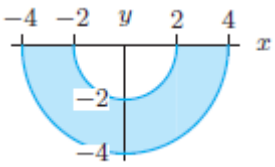
$$\int_{1}^{4}\int_{-1}^{2} dy\,dx$$

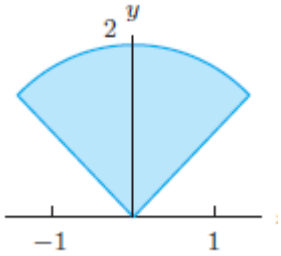
b) Evaluate the integral

$i.\int_0^2\int_0^3(x^2+y^2)dy\,dx \qquad ii.\int_0^{\pi}\int_0^{x} y\,e^{xy}\,dx\,dy$

Question # 02

a) Interpret $\int f\ dA$ as an iterated integral in polar coordinates.





b) Illustrate the region of integration

$$i.\int_{0}^{4}\int_{-\pi/2}^{\pi/2} f(r,\theta)r\,dr\,d\theta \qquad ii.\int_{3}^{4}\int_{3\pi/4}^{3\pi/2} f(r,\theta)r\,dr\,d\theta$$

Question # 03

Evaluate the following integral

i) (a) For $a > 0$, find the volume under the graph of $z = e^{(x^2+y^2)}$ above the disk $x^2 + y^2 \leq a^2$.

(b) What happens to the volume as $a \to \infty$?

Question # 04

Solve the triple integrals of the function over the region W.

i. $f(x,y,z) = x^2 + 5y^2 - z$, W is the rectangular box $0 \leq x \leq 2$, $-1 \leq y \leq 1$, $2 \leq z \leq 3$.

ii. $f(x,y,z) = \sin(x^2 + y^2)$, W is the solid cylinder with a height 4 and with a base of radius 1 centered on the z-axis at $z = -1$.

iii. $f(\rho,\theta,\varphi) = sin\varphi$ over the region $0 \leq \theta \leq 2\pi$, $0 \leq \varphi \leq \pi/4$, $1 \leq \rho \leq 2$.

iv. $f(x,y,z) = 1/(x^2 + y^2 + z^2)^{1/2}$ over the bottom half of the sphere of radius 5 centered at the origin.