	Name of the School	School of Basic & Applied Sciences	Name of the Department	Mathematics
	Name of the Program	B.Tech, CSE	Course Code- Course	UBS 1003M
	Session	2024-25	Branch, Year & Semester	CSE , 1st, 1st

UNIT 3: INTEGRAL CALCULUS

Work Sheet

SECTION A

Short Answer type Questions

Multiple integration: Double integral, Triple integral, Change of order of integration, Change of variables, Applications: Areas and volumes, Center of mass and center of gravity (Constant and variable densities)

1. Evaluate $\int_0^2 \int_0^{x^2} e^{\frac{y}{x}} \, dy \, dx$

2. $\int_0^a \int_0^{\sqrt{a^2-x^2}} \sqrt{a^2 - x^2 - y^2} \, dy \, dx$

3. $\int_0^1 \int_x^{\frac{1}{x}} e^{\frac{y}{x}} \frac{y}{(1+y^2)(1+xy)^2} \, dy \, dx$

4. $\int_{-1}^1 \int_{-2}^2 \int_{-3}^3 dx \, dy \, dz$

5. $\int_1^e \int_1^{\log y} \int_1^{e^x} \log z \, dz \, dx \, dy$

6. $\int_0^2 \int_0^x \int_0^{2x+2y} e^{x+y+z} \, dz \, dy \, dx$

SECTION B

Long Answer type Questions

1. Evaluate $\int_1^2 \int_{-\sqrt{2-y}}^{\sqrt{2-y}} 2x^2 \, y^2 \, dx \, dy$.

2. Find $\int \int \int (x^2 + y^2 + z^2) dx \, dy \, dz$, where the region is bounded by $x = 0, y = 0, z = 0, and \frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 2$.

3. Evaluate $\int \int \int xyz \, (x^2 + y^2 + z^2) dx \, dy \, dz$, over the first octant of the sphere $(x^2 + y^2 + z^2) = a^2$.

4. Change of order of integration and evaluate $\int_0^a \int_0^x \frac{Sin \, y \, dy \, dx}{\sqrt{[(a-x)(x-y)]} \, (4-5\cos y)^2}$

5. Evaluate $\int_0^a \int_0^a \frac{x \, dy \, dx}{x^2 + y^2}$ by changing to polar co-ordinates.

6. Evaluate $\int \int \frac{(x^2+y^2)^2}{x^2 y^2} \, dx \, dy$ over the area common to $x^2 + y^2 = ax$ and $x^2 + y^2 = by$; $a, b > 0$

7. Evaluate $\int \int \frac{x^2 y^2}{(x^2+y^2)} \, dx \, dy$ over the annular region between circles $(x^2 + y^2 = a^2)$ and

   $(x^2 + y^2 = b^2)$; $a, b > 0$.