St.JOSEPH'S COLLEGE OF ENGINEERING, CHENNAI-119
St.JOSEPH'S INSTITUTE OF TECHNOLOGY, CHENNAI-119

I-YEAR B.E / B.TECH (COMMON TO ALL BRANCHES)
MA6151/ MATHEMATICS – I

ASSIGNMENT – V

UNIT V - MULTIPLE INTEGRALS

PART - A

1. Evaluate $\displaystyle\int_{2}^{a}\int_{2}^{b}\frac{dx\,dy}{xy}$.

2. Evaluate $\displaystyle\int_{1}^{2}\int_{0}^{x^2} x\,dx\,dy$.

3. Change the order of integration in $\displaystyle\int_{0}^{a}\int_{x}^{a} f(x,y)\,dy\,dx$.

4. Shade the region of integration in $\displaystyle\int_{0}^{a}\int_{\sqrt{ax-x^2}}^{\sqrt{a^2-x^2}} dx\,dy$.

5. Transform the integration $\displaystyle\int_{0}^{\infty}\int_{0}^{y} dx\,dy$ into polar co-ordinates.

6. Evaluate $\displaystyle\int_{0}^{a}\int_{0}^{b}\int_{0}^{c} dx\,dy\,dz$.

7. Compute the entire area bounded by $r^2 = a^2\cos2\theta$.

8. Evaluate $\displaystyle\int_{0}^{\pi/2}\int_{0}^{\sin\theta} r\,dr\,d\theta$.

PART – B

1. a) Evaluate $\displaystyle\iint_{R}\frac{e^{-y}}{y}dx\,dy$, where R is the region bounded by the lines $x = 0$, $x = y$, and $y = \infty$.

   b) Find the area of the cardioid $r = a(1+\cos\theta)$.

2. a) Change the order of integration in $\displaystyle\int_{0}^{1}\int_{x^2}^{2-x} x\,y\,dy\,dx$ and hence evaluate it.

b) Transform the integral into polar co-ordinates and hence evaluate $\int_0^\infty \int_0^\infty e^{-\left(x^2+y^2\right)} dx\, dy$.

3. a) Find the volume of the tetrahedron bounded by the planes $x = 0$, $y = 0$, $z = 0$ and

$$\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1.$$

b) Find the area between the parabolas $y^2 = 4ax$ and $x^2 = 4ay$.

4. a) Change the order of integration in $\int_0^a \int_y^a \frac{x}{x^2 + y^2} dx\, dy$ and hence evaluate it.

b) Evaluate $\iiint_V \frac{dx\, dy\, dz}{\sqrt{a^2 - x^2 - y^2 - z^2}}$ over the first octant of the sphere $x^2 + y^2 + z^2 = a^2$.