

**I B. Tech., EVEN Semester, A. Y. 2024-25
Linear Algebra & Calculus for Engineers (23MT1001)**

Tutorial Problems on CO3

Tutorial-7

- 1 Compute the value of $\Gamma\left(\frac{13}{2}\right)$ and $\Gamma\left(\frac{-7}{2}\right)$
- 2 Evaluate the integral $\int_0^4 \frac{1}{\sqrt{16-x^2}} dx$ using β - Γ functions.
- 3 Evaluate $\int_0^\infty e^{-2x} x^5 dx$ in terms of Gamma function
- 4 Evaluate $\int_0^{\frac{\pi}{2}} \frac{d\theta}{\sqrt{\sin\theta}} \times \int_0^{\frac{\pi}{2}} \sqrt{\sin\theta} d\theta$
- 5 Evaluate the integral $\int_0^{\frac{\pi}{2}} (\sqrt{\tan\theta} + \sqrt{\sec\theta}) d\theta$ using $\beta - \Gamma$ functions
- 6 Evaluate the integral $\int_0^1 x^7 (1-x)^4 dx$ using $\beta - \Gamma$ functions
- 7 Evaluate $\int_0^\infty \frac{x^7(1+x^3)}{(1+x)^{12}} dx$ in terms of beta-gamma function

Tutorial-8

1. Evaluate the integral $\int_{x=0}^3 \int_{y=0}^2 3y(x+y) dx dy$
2. Sketch the region R in the xy-plane bounded by the curves $x^2 = 2y$ and $y = 2x$ and determine its area.
3. Sketch the region R in the xy-plane bounded by the curves $y^2 = x$ and $y = x^2$ and determine its area.
4. Evaluate $\iint xy dx dy$ over the region in the positive quadrant of circle $x + y = 1$
5. Evaluate $\int_0^{\pi/4} \int_0^{a \sin \theta} \frac{r}{\sqrt{a^2 - r^2}} dr d\theta$
6. Evaluate the double integral $\iint r dr d\theta$ where R is region enclosed between the circle $r = 1$ & $r = 2$.
7. Evaluate $\int_0^a \int_0^{\sqrt{a^2-x^2}} (x^2 + y^2) dx dy$ by changing to polar co-ordinates

8. Change the order of integration and hence evaluate $\int_0^1 \int_x^1 (x^2 + y^2) dy dx$
9. Change the order of integration and hence evaluate $\int_0^{4a} \int_{\frac{x^2}{4a}}^{2\sqrt{ax}} dy dx$.

Tutorial-9

1. Evaluate the triple integral $\int_0^1 \int_0^2 \int_0^3 (x + y + z) dx dy dz$
2. Evaluate the integral $\iiint_B dV$ where $B: 2 \leq x \leq 3, 1 \leq y \leq 2$ and $0 \leq z \leq 1$
3. Evaluate the triple integral $\int_0^1 \int_{y^2}^1 \int_0^{1+x} x dz dx dy$
4. Evaluate the triple integral $\int_1^e \int_1^{\log y} \int_1^{e^x} \log z dz dx dy$
5. Evaluate the integral $\iiint_B xyz dV$, where $B: 2 \leq x \leq 3, 1 \leq y \leq 2$ and $0 \leq z \leq 1$
6. Determine the volume of the tetrahedron bounded by the coordinate planes and the plane $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$
7. Calculate the volume of the solid bounded by the planes $x = 0, y = 0, x + y + z = 1$ and $z = 0$