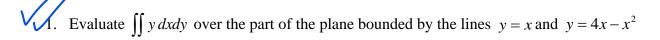
ABES ENGINEERING COLLEGE, GHAZIABAD (032)

B. TECH FIRST SEMESTER 2023-2024

ENGINEERING MATHEMATICS-I (BAS-103)

UNIT-4 (MULTIVARIABLE CALCULUS-I)

QUESTION BANK



- Evaluate $\iint xy \, dx \, dy$ over the region in the positive quadrant for which $x + y \le 1$.
- 3 Let D be the region in the first quadrant bounded by the curves xy = 16, x = y, y = 0 and x = 8. Sketch the region of integration of the following integral $\iint_D x^2 dx dy$ and evaluate it by expressing it as an appropriate repeated integral.
- 4. Show that $\iint r^2 \sin \theta \, dr d\theta = \frac{2a^2}{3}$, where R is the region bounded by the semi-circle Answer is 2a³/3

- $r = 2a\cos\theta$, above the initial line. 5. Evaluate $\int_0^{\pi} \int_0^{a(1+\cos\theta)} r^2 \cos\theta \, dr d\theta$.
- Evaluate the following integral by changing the order of integration: $\int_0^1 \int_{x^2}^{2-y} xy \, dx \, dy$.
- \checkmark . Evaluate the following integral by changing the order of integration: $\int_0^\infty \int_0^y ye^{-\frac{y^2}{x}} dx dy$. Answer is -1/2
- Evaluate the following integral by changing the order of integration: $\int_0^2 \int_{\frac{x^2}{2}}^{3-x} xy \, dy \, dx$
- 9. Evaluate the following integral by changing the order of integration: $\int_0^3 \int_0^{\frac{1}{x}} x^2 dy dx$
- 10. Evaluate $\iiint_R (x+y+z)dxdydz$, where R is the region determined by Answer: 87/140 $0 \le x \le 1, 0 \le y \le x^2, 0 \le z \le x + y.$
- 1. Let D be the region in the first quadrant bounded by x = 0, y = 0 and x + y = 1. Change the variable x, y to u, v where x + y = u, y = uv and evaluate $\iint xy(1-x-y)^{1/2} dxdy$.
- 12. Using the transformation x y = u, x + y = v, show that $\iint_{R} \sin\left(\frac{x y}{x + y}\right) dx dy = 0$, where R is bounded by the coordinate axes and x + y = 1 in the first quadrant. Since, no region is bounded in the 1st quadrant, so area=0
- Evaluate $\int_0^{2a} \int_0^{\sqrt{2ax-x^2}} (x^2 + y^2) dxdy$ by changing into polar co-ordinates. Answer: 2a^4 pie
- 14. Prove the relation between Beta and Gamma function.
- 13. Using the beta and gamma functions, evaluate $\int_0^1 \left(\frac{x^3}{1-x^3}\right)^{1/2} dx$.

16. Compute
$$\iiint_V x^2 dx dy dz$$
 over volume of tetrahedron bounded by $x = 0, y = 0, z = 0$ and $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$

ANSWERS:

SECTION - B

- 1: 54/5
- 2. 1/24
- 3.448
- 5. $\frac{5}{8}\pi a^3$
- 6. 3/8
- 7. 1/2
- 8.8/3
- 9.27
- 10. 9/2
- 11. 16/945
 - $\frac{3\pi\alpha^4}{4}$
- 12. $a^3bc/_{60}$
- 16. $\frac{b^6}{48}$