# Engineering Mathematics I-(BAS-103)
## Unit 4 Multiple Integration
## Tutorial 10

**Que 1.** Change the order of integration in I=$\int_0^1 \int_{x^2}^{2-x} xy\, dy\, dx$ and hence evaluate the same.
**[2014-15], [2015-16], [2017-18], [2019-20], [2021-22]**

**Que 2.** Evaluate by changing the order of integration $\int_0^\infty \int_x^\infty \frac{e^{-y}}{y}\, dy\, dx$ **[2020-21]**

**[2015-16]**

**Que 3.** Changing the order of integration in I=$\int_0^8 \int_{\frac{x}{4}}^2 f(x,y)\, dy\, dx$ leads to I=$\int_r^s \int_p^q f(x,y)\, dy\, dx$. What is the value of q?

**[2016-17]**

**Que 4.** . Change the order of integration in I=$\int_0^2 \int_{\frac{x^2}{4}}^{3-x} xy\, dy\, dx$ and then evaluate it. **[2018-19]**

**Que 5.** Evaluate by changing the order of integration $\int_0^\infty \int_0^x x e^{-\frac{x^2}{y}}\, dy\, dx$

**Que 6.** Evaluate the double integral $\int_0^a \int_{\sqrt{ax}}^a \frac{y^2}{\sqrt{y^4-a^2x^2}}\, dx\, dy$ by changing the order of integration **[2022-23]**

**Que 7.** Evaluate $\int\int_R (x+y)^2 dx\, dy$ where R is the parallelogram in x-y plane with vertices at (1,0),(3,1),(2,2) and (0,1) by using the transformation $u = x + y\,, v = x - 2y$ **[2019-20]**

**Que 8.** Evaluate by changing the variables $\int\int_R (x+y)^2 dx\, dy$ where R is the region bounded by the parallelogram plane $x + y = 0\,, x + y = 2, 3x - 2y = 0 \text{ and } 3x - 2y = 3$ **[2020-21]**

**Que 9.** Evaluate the integral $\int\int_R (y-x) dx\, dy$ by changing the variables where R is the region in xy plane bounded by the lines $y - x = -3\,, y - x = 1, x + \frac{1}{3}y = \frac{7}{3} \text{ and } x + \frac{1}{3}y = 5$ **[2023-24]**

**Que 10.** Evaluate $\int_0^\infty \int_x^\infty e^{-(x^2+y^2)}\, dy\, dx$ by changing into polar coordinates. Hence show that $\int_0^\infty e^{-x^2} dx = \frac{\sqrt{\pi}}{2}$

**Que 11** Transform the integral $\iiint (x+y+z) x^2 y^2 z^2\, dx\, dy\, dz$ taken over the volume bounded by $= 0\,, y = 0\,, z = 0$ $x + y + z = 1$ substituting $= x + y + z\,, uv = x + y\,, uvw = y$ and then evaluate it.

**Que12** Evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} \frac{dx\, dy\, dz}{\sqrt{1-x^2-y^2-z^2}}$ by changing into spherical polar coordinates.

## ANSWER

1. $\frac{3}{8}$
2. 1
3. 4y
4. $\frac{8}{3}$
5. $\frac{1}{2}$
6. $\frac{\pi a^2}{6}$
7. 21
8. $\frac{8}{5}$
9. -8
10. $\frac{\pi}{4}$
11. $\beta(3,3).\beta(6,3) = \frac{1}{50400}$
12. $\frac{\pi^2}{8}$