UNIT-1(Partial Differentiation)

Q.1: If the function is given by $f(x,y,z) = 2x + 2y + 2z$ then use Lagrange's multiplier method to find the greatest value if it is related as $\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 6$.

Q.2: Find the tangent plane $x^2 + y^2 + z^2 = 30$ at (1,1,1).

Q.3: If $f(x,y) = x^2 y + cosy + ysiny$ then find all second order partial derivatives.

Q.4: Find the extreme values of $f(x,y,z) = 10x^2 + 8yz - 32z + 1200$ takes on the ellipsoid $g(x,y,z) = 5x^2 + y^2 + 4z^2 - 15 = 0$.

Q.5: Find the shortest distance from the origin to the surface $xyz^2 = 2$.

Q.6: Find the tangent plane $\boldsymbol{x^2} + 2xy - y^2 + z^2 = 7$ at $(1,-1,3)$.

Q.7: If $u = \log(x^3 + y^3 + z^3 - 3xyz)$ then prove that $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = \frac{3}{x+y+z}$.

Q.8: Expand $e^y cosx$ in ascending powers of $(x - \frac{\pi}{2})$ and y up to term of third degree.

Q.9: Expand $x^2 + xy + y^2$ in ascending powers of $(x-1)$ and $(y-2)$ up to third degree.

Q.10: If $u = (x^2 + y^2 + z^2)^{-1/2}$ the prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial x} + z\frac{\partial u}{\partial x} = -u$.

Q.11: Find the tangent plane $x^2 + y^2 + z = 9$ at (1,2,3).

Q.12: Expand $e^y \log(1+x)$ about origin up to term of third degree.

UNIT-2 (Multiple Integral)

Q.1: Describe the region of integration and evaluate

$$\int_0^3 \int_{-y}^{y} (x^2 + y^2)dxdy$$

Q.2: Find the volume of the solid that is bounded by the cylinder $z = x^2$and below by the region enclosed by the parabola $y = 2 - x^2$ and the line $y = x$.

Q.3: Change the order of integration and evaluate

$$\int_0^\infty \int_x^\infty \frac{e^{-y}}{y} dydx$$

Q.4: Evaluate $\int_0^1 \int_{y^2}^1 \int_0^{1-z} zdv$.

Q.5: Find the volume of the region bounded by the surface $y = x^2$, $x = y^2$ and the planes $z = 0$ to $z = 3$.

Q.6: Evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} y^2\sqrt{x^2 + y^2}dydx$ by changing to polar-coordinates.

Q.7: Change the order of integration and evaluate

$$\int_0^1 \int_{x^2}^{2-x} xydydx$$

Q.8: Evaluate $\iiint_V (x^2 + y^2 + z^2)\, dV$ where V is the region bounded by $x = 0, y = 0, z = 0$ and $x + y + z = a$.

Q.9: Evaluate

$$\iint_R (x^2 + y^2)dxdy$$

throughout the area enclosed by curve $y = 4x$, $x + y = 3$, $y = 0$ and $y = 2$.

Q.10: Evaluate the integral

$$\int_0^\infty \int_0^\infty e^{-(x^2+y^2)}dxdy$$

By changing to polar coordinate.

Q.11: Evaluate $\iint_R x^2y^2dxdy$, where R is the region bounded by $x = 0, y = 0$ and $x^2 + y^2 = 1, x \geq 0, y \geq 0$.

Q.12: Find the volume of the solid in the first octant bounded by the coordinate planes, the cylinder $x^2 + y^2 = 4$ and the plane $y + z = 3$.