

The Open University of Sri Lanka
B.Sc Degree Programme
Closed Book Test (CBT)- 2010/2011
Level 04- Applied Mathematics
APU 2143 – Vector Calculus
Duration :- One and half hours



Date:- 16. 10. 2010

Time:- 4.00 p.m. - 5.30 p.m.

Answer All Questions.

1. (a) Compute the directional derivative of the function $f(x, y) = x^2 + xy + y^2$ at $P(1, -1)$ in the direction toward the origin.
(b) Minimize $f(x, y, z) = 2x^2 + 3y^2 + 4z^2$ subject to $x + y + z = 4$ and $x - 2y + 5z = 3$.

2. (a) Find the surface integral of the function $f(x, y) = 2y - x$ over the region bounded by $y = x^2$ and $y = 2x$.
(b) Use surface integral to find the area bounded by $y = x^2 + 2x + 6$ and $y = x - 1$.

3. (a) Use plane polar coordinates to evaluate the surface integral of the function $f(x, y) = e^{-x^2 - y^2}$ over the region in the first quadrant bounded by $x^2 + y^2 = 1$ and $x^2 + y^2 = 9$.
(b) Find the volume integral of the function $f(x, y, z) = xyz$ over the region bounded by the surfaces $x = 0$, $x = 1$, $y = -1$, $y = 2$, $z = 0$, and $z = 3$.