

The Open University of Sri Lanka

B.Sc Degree Programme/ Continuing Education Programme

Closed Book Test (CBT)- 2010/2011

Level 04- Pure Mathematics

PMU 2191/PME 4191 – Vector Analysis

Duration :- One and half hours



Date:- 16.10.2010

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

Answer All Questions.

1. (a) Evaluate $\int_S xy \, dA$, where S is the circle $x^2 + y^2 = 4$ in the first quadrant.
(b) Evaluate surface integral $\int_S x \, dA$, where S is the region given by $y=0$, $x \geq y$ and $x+2y \leq 4$.
(c) Use surface integral to calculate the area of the quarter of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ for which $x \geq 0$ and $y \geq 0$.

2. (a) Find the value of the volume integral of the function $f(x, y, z) = 2z + 3x - 1$ over the region inside the circular cylinder $x^2 + y^2 = 1$ and lying between the planes $z = 0$ and $z = 2$.
(b) Find $\int_B 3z^2 \, dV$, where B is the region given by $x^2 + y^2 + z^2 = 1$.
(c) Find volume of the tetrahedron bounded by the coordinate planes and the plane through $(2, 0, 0)$, $(0, 3, 0)$ and $(0, 0, 1)$.

3. (a) Find the moment of inertia of a circular cylinder of constant density ρ and radius a and height h about its axis of symmetry.
(b) The vector field $\underline{F} = x^2 yz \underline{i} + xy^2 z \underline{j} + xyz^2 \underline{k}$ is defined over the region bounded by the planes $x=0$, $x=a$, $y=0$, $y=b$, $z=0$ and $z=c$. Evaluate $\oint_S \underline{F} \cdot \underline{n} \, dA$, where \underline{n} is the unit outward normal to the closed surface S .