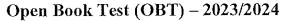
The Open University of Sri Lanka

B.Sc./B.Ed. Degree/Continuing Education Programme – Level 04



Applied Mathematics

ADU4302/ADE4302- Vector Calculus

Duration :- One Hour

Date :- 21-07-2023

Time :- 1.00 p.m. - 2.00 p.m.

Answer All Questions.

- 1. (a) Find the domain and range of the function $f(x, y) = \sqrt{x^2 + y^2 4}$.
 - (b) Sketch the level curves of the function $f(x,y) = x^2 + y^2 2x 2y$.
- 2. Evaluate the following limits, if they exist:

(a)
$$\lim_{(x,y)\to(0,0)} \frac{x^2-xy}{\sqrt{x}-\sqrt{y}}$$

(b)
$$\lim_{(x,y)\to(0,0)} \frac{4xy^2}{x^2+3y^4}$$

3. If
$$z = xy + f(x^2 + y^2)$$
 then show that $y \frac{\partial z}{\partial x} - x \frac{\partial z}{\partial y} = y^2 - x^2$.

- 4. Using chain rule, find $\frac{df}{dt}$ in terms of t, for the function $f(x,y) = 4x^2 + 3y^2$, where $x = \sin t$ and $y = \cos t$.
- 5. Find Taylor's expansion of $f(x, y) = e^{x+y}$ about the point (0, 0).
- 6. Find the directional derivative of the function $f(x,y) = y^2 \sin 2x$ at the point $P\left(\frac{\pi}{4}, 2\right)$ in the direction of $\underline{u} = 5\underline{i} + 12\underline{j}$.
- 7. Find the equation of the tangent plane to the surface $z = 4 x^2 y^2$ at the point P(1, 1, 2).
- 8. Find the local extrema of the function $f(x, y) = x^3 + 2xy 6x 4y^2$ and determine their nature.

