Question Bank

Department:Common for All **Semester: I** **Academic Year: 2024- 2025**

Class: F.Y.B.Tech. **Div: All** **Date:**

Course: Engineering Mathematics I & Linear Algebra and Differential Calculus

Unit IV – Partial Differentiation

Q. No.	Question	Marks	CO	Blooms Level
Q.1	If $z = \tan(y+ax) + (y-ax)^{\frac{3}{2}}$ find the value of $\frac{\partial^2 z}{\partial x^2} - a^2 \frac{\partial^2 z}{\partial y^2}$.	5	CO4	2
Q.2	If $T = \sin\left(\frac{xy}{x^2+y^2}\right) + \sqrt{x^2+y^2}$,by using Euler's theorem ,find $x\frac{\partial T}{\partial x} + y\frac{\partial T}{\partial y}$.	5	CO4	3
Q.3	If $u = sin^{-1}\left(\frac{x+y}{\sqrt{x}+\sqrt{y}}\right)$, by using Euler's theorem prove that $x^2\frac{\partial^2 u}{\partial x^2} + 2xy\frac{\partial^2 u}{\partial x \partial y} + y^2\frac{\partial^2 u}{\partial y^2} = \frac{1}{4}(tan^3 u - \tan u)$.	5	CO4	3
Q.4	If $u = tan^{-1}\left(\frac{x^3+y^3}{x-y}\right)$ then prove that $x^2\frac{\partial^2 u}{\partial x^2} + 2xy\frac{\partial^2 u}{\partial x \partial y} + y^2\frac{\partial^2 u}{\partial y^2} = (1-4sin^2 u)\sin 2u$	5	CO4	2
Q.5	If $u = ax + by$; $y = bx - ay$ then find the value of $\left(\frac{\partial u}{\partial x}\right)_y \left(\frac{\partial x}{\partial u}\right)_v \left(\frac{\partial y}{\partial v}\right)_x \left(\frac{\partial v}{\partial y}\right)_u$.	5	CO4	2
Q.6	If $u = sin^{-1}\left(\sqrt{x^2+y^2}\right)$ then find the value of $x^2\frac{\partial^2 u}{\partial x^2} + 2xy\frac{\partial^2 u}{\partial x \partial y} + y^2\frac{\partial^2 u}{\partial y^2}$.	5	CO4	3
Q.7	If $u = f(r,s)$ where $r = x^2+y^2, s = x^2-y^2$ then show that $y\frac{\partial u}{\partial x} + x\frac{\partial u}{\partial y} = 4xy\frac{\partial u}{\partial r}$.	5	CO4	2
Q.8	If $u = \ln(x^2+y^2)$, *show that* $\frac{\partial^2 u}{\partial x \partial y} = \frac{\partial^2 u}{\partial y \partial x}$	5	CO4	2

Q.9	If $e^{2u} = y^2 - x^2$, $cosec\ v = \frac{y}{x}$ then find the value of $\left(x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y}\right)\left(x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y}\right)$.	5	CO4	3
Q.10	If $u = f(x - y, y - z, z - x)$ then find the value of $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z}$	5	CO4	2
Q.11	If $u = ax + by$, $v = bx - ay$ then find the value of $\left(\frac{\partial u}{\partial x}\right)_y \left(\frac{\partial x}{\partial v}\right)_u$	5	CO4	2
Q.12	If $u = \log(x^3 + y^3 - xy^2 - x^2y)$ then prove that $\left(\frac{\partial}{\partial x} + \frac{\partial}{\partial y}\right)^2 u = \frac{-4}{(x+y)^2}$.	5	CO4	2

Course faculty