



**L.D. COLLEGE OF ENGINEERING
NAVRANGPURA, AHMEDABAD-15.**

**P.D.D.C. SEM-2
SUBJECT: MATHS-2**

**TUTORIAL
PARTIAL DIFFERENTIAL EQUATION**

(1)	Form Partial differential equation for the following:
	(1) $z = ax + by + a^2 + b^2$ (2) $z = (x-1)^2 + (y-2)^2$ (3) $2z = \frac{x^2}{a^2} + \frac{y^2}{b^2}$
	(4) $z = f(x^2 - y^2)$ (5) $z = xy + f(x^2 + y^2)$ (6) $z = f\left(\frac{xy}{2}\right)$
	(7) $f(x+y+z, x^2+y^2+z^2) = 0$ (8) $f(xy+z^2, x+y+z) = 0$
(2)	Solve using the method of Direct Integration:
	(1) $\frac{\partial^2 z}{\partial x^2} = \sin x$ (2) $\frac{\partial^2 z}{\partial x \partial y} = x^3 + y^3$ (3) $\frac{\partial^3 z}{\partial x^2 \partial y} = \cos(2x+3y)$
	(4) $\frac{\partial^2 z}{\partial x \partial y} = \sin x \sin y$; also when $x=0$ then $\frac{\partial z}{\partial y} = -2 \sin y$ and when y is an odd multiple of $\frac{\pi}{2}$ then $z=0$
	(5) $\frac{\partial^2 z}{\partial x^2} = a^2 z$ given that when $x=0, z=e^y, \frac{\partial z}{\partial x} = e^{-y}$.
	(6) $\frac{\partial^2 z}{\partial x^2} = z$ Given that $\frac{\partial u}{\partial y} = -2 \sin y$ when $x=0$ and $u=0$ when y is an odd multiple of $\frac{\pi}{2}$.
(3)	Using Method of separation of Variables solve:
	(1) $\frac{\partial u}{\partial x} = 2 \frac{\partial u}{\partial t} + u$, given that $u(x,0) = 6e^{-3x}$
	(2) $\frac{\partial u}{\partial x} = 4 \frac{\partial u}{\partial y}$ where $u(0,y) = 8e^{-3y}$
	(3) $x \frac{\partial u}{\partial x} - 2y \frac{\partial u}{\partial y} = 0$ (4) $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 2(x+y)u$
	(5) $\frac{\partial^2 u}{\partial x^2} = 16 \frac{\partial u}{\partial y}$ (6) $\frac{\partial^2 u}{\partial x^2} - 2 \frac{\partial u}{\partial x} + \frac{\partial z}{\partial y} = 0$
(4)	Solve: (Special types of Nonlinear Partial differential equations of the First order)
(A)	(1) $q = pq + p^2$ (2) $p^2 + q^2 = 2$ (3) $pq + p + q = 0$
(B)	(1) $p^2 + q^2 = x^2 + y^2$ (2) $p + q = \sin x + \sin y$ (3) $p^2 + q^2 = x + y$

(C)	(1) $z = p^2 + q^2$	(2) $p(1+q) = qz$	(3) $p^2 z^2 + q^2 = 1$
(D)	(1) $z = px + qy + 2\sqrt{pq}$	(2) $z = px + qy p^2 q^2$	(3) $z = px + qy \frac{q}{p}$
(5)	Solve using Lagrange's method:		
	(1) $x(y-z)p + y(z-x)q = z(x-y)$ (2) $(mz-ny)p + (nx-lz)q = ly - mx$ (3) $y^2 zp - x^2 zq = x^2 y$ (4) $pz - qz = z^2 + (x+y)^2$ (5) $(z^2 - 2yz - y^2)p + (xy + xz)q = xy - xz$ (6) $(x^2 - yz)p + (y^2 - zx)q = z^2 - xy$		