



Direction – (Q_n 1 to Q_n 6)

Derive a partial differential equation by elimination of arbitrary constants.

Q.1) $z = (x+a) (y+b)$

Q.2) $z = ax + by + ab$

Q.3) $z = (x^2 + a) (y^2 + b)$

Q.4) $2z = \frac{x^2}{a^2} + \frac{y^2}{b^2}$

Q.5) $(x - a)^2 + (y - b)^2 = z^2 - c$

Q.6) $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$

Direction – (Qⁿ 7 to Qⁿ 10)

Form the partial differential equation by eliminating the arbitrary function

Q.7) $z = f\left(\frac{y}{x}\right)$

Q.8) $z = f(x^2 - y^2)$

Q.9) $z = y^2 + 2f\left(\frac{1}{x} + \log y\right)$

Q.10) $z = f(x + iy) + g(x - iy)$

Direction – (Qⁿ 11 to Qⁿ 12)

Solve following P.D.E using direct integration method

Q.11) $\frac{\partial^3 z}{\partial x^2 \partial y} + 18xy^2 + \sin(2x - y) = 0$

Q.12) $\frac{\partial^2 z}{\partial x^2} + z = 0$ given $z = e^y$ and $\frac{\partial z}{\partial x} = 1$ at $x = 0$

Direction – (Qⁿ 13 to Qⁿ 28)

Solve following linear partial differential equation of first order using Lagarange method

Q.13) $yzp + xzq = xy$

Q.14) $y^2zp + x^2zq = y^2x$

Q.15) $p \tan x + q \tan y = \tan z$

Q.16) $pz - qz = z^2 + (x + y)^2$

Q.17) $y^2p - xyq = x(z - 2y)$

Q.18) $(y+z)p + (z+x)q = (x+y)$

Q.19) $x^2p + y^2q = (x + y)z$

Q.20) $(x^2 - yz)p + (y^2 - zx)q = z^2 - xy$

Q.21) $(x^2 - y^2 - z^2)p + 2xyq = 2xz$

Q.22) $y^2p - xyq = x(z - 2y)$

Q.23) $x(y-z)p + y(z-x)q = z(x-y)$

Q.24) $x^2(y - z)p + y^2(z - x)q = z^2(x - y)$

Q.25) $(x^2 + y^2 - z^2)p + 2xyq = 2xz$

Q.26) $(z^2 - 2yz - y^2)p + (xy + 2x)q = (xy - zx)$

Q.27) $\frac{y-z}{yz} p + \frac{z-x}{zx} q = \frac{x-y}{xy}$

Q.28) $(x+2z)p + (4xz-y)q = 2x^2 + y$

Direction – (Qⁿ 29 to Qⁿ 34)

Solve following nonlinear PDE using Charpit method

Q.29) $px + qy = pq$

Q.30) $(p^2 + q^2)y = qz$

Q.31) $2(z + xp + yq) = yp^2$

Q.32) $2z + p^2 + qy + 2y^2$

Q.33) $p^2 - q^2 = x - y$

Q.34) $p^2 + q^2 = x + y$

Direction – (Qⁿ 35 to Qⁿ 56)

Solve following Homogeneous Hr. Order PDE

Q.35) $(D^2 + 3DD' + 2D'^2)z = x + y$

Q.36) $(D^2 + 3DD' + 2D'^2)z = 24xy$

Q.37) $r - 2s + t = x - y$

Q.38) $r - 2s + t = 12xy$

Q.39) $(D^2 - DD' - 6D'^2)z = xy$

Q.40) $2r - 5s + 2t = 24(y - x)$

Q.41) $(D^2 - 6DD' - 9D'^2)z = 12(x^2 + 3xy)$

Q.42) $(D^2 + 2DD' + D'^2)z = x^2 + y^2 + xy$

Q.43) $r + 2s + t = e^{2x+3y}$

Q.44) $(D^2 - 2DD' + D'^2)z = e^{x+y}$

Q.45) $(D^3 - 3D^2D' + 4D'^3)z = e^{x+2y}$

Q.46) $4r + 12s + 9t = e^{3x-2y}$

Q.47) $(D^3 - 4D^2D' + 5DD'^2 - 2D'^3)z = e^{2x+y}$

Q.48) $(D^3 - 2D^2D')z = 2e^{2x} + 3x^2y$

Q.49) $(D^2 - DD' - 2D'^2)z = (y - 1)e^x$

Q.50) $(D^2 + DD' - 6D'^2)z = \cos(2x + 3y)$

Q.51) $r - 2s + t = \sin(2x + 3y)$

Q.52) $(D^2 + DD' - 6D'^2)z = \cos(2x + y)$

Q.53) $(D^2 + DD' - 6D'^2)z = y \cos x$

Q.54) $(D^3 - 4D^2D' + 4DD'^2)z = 6\sin(3x + 2y)$

Q.55) $(D^2 - DD')z = \cos x + \cos 2y$

Q.56) $(2D^2 - 5DD' + 2D'^2)z = 5\sin(2x + y) + e^{x-y}$

Direction – (Qⁿ 57 to Qⁿ 60)

Solve following nonhomogeneous Hr. Order PDE

Q.57) $(D^2 + 2DD' + D'^2 - 2D - 2D')z = \sin(x + 2y)$

Q.58) $(D^2 + DD' + D' - 1)z = \sin(x + 2y)$

Q.59) $(D - D' - 1)(D - D' - 2)z = e^{2x-y} + X$

Q.60) $(D^2 - DD' + D' - 1)z = \cos(x + 2y)$

Direction – (Qⁿ 61 to Qⁿ 66)

Solve using separation of variable

Q.61) $\frac{\partial^2 z}{\partial x^2} - 2 \frac{\partial z}{\partial x} + \frac{\partial z}{\partial y} = 0$

Q.62) $y^3 \frac{\partial z}{\partial x} + x^2 \frac{\partial z}{\partial y} = 0$

Q.63) Solve $\frac{\partial^2 u}{\partial x^2} = \frac{\partial u}{\partial t}$

if $u=0$ when $t=\infty$ & $u=0$ at $x=0$ & $x=1$

Q.64) $\frac{\partial u}{\partial x} = 2 \frac{\partial u}{\partial t} + w$ where $u(x,0) = 6e^{-3x}$

Q.65) Find solution of wave eqⁿ $(\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2})$

Q.66) Find solution of 1D heat flow equation

$$\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$$