B.Sc. - I CBCS Pattern Semester-II

# USMT-04 - Mathematics Paper-II (Partial Differential Equations)

P. Pages : 2 **GUG/W/23/11587**

Time : Three Hours * 6 5 6 8 * Max. Marks : 60

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Notes : 1. Solve **all five** questions.
2. All questions carry equal marks.

## UNIT – I

**1.** a) Form the PDE by eliminating arbitrary function f from equation. **6**

$f\left(x+y+z,\ x^2+y^2+z^2\right)=0$.

b) Find the integral curves of **6**

$$\frac{dx}{x(y-z)}=\frac{dy}{y(z-x)}=\frac{dz}{z(-y+x)}$$

**OR**

c) Find the general integral of the PDE. **6**

$\left(x^2-yz\right)p+\left(y^2-zx\right)q=z^2-xy$.

d) Solve $\left(y^2+yz\right)dx+\left(z^2+zx\right)dy+\left(y^2-xy\right)dz=0$. **6**

## UNIT – II

**2.** a) Show that the PDE z = px + qy is compatible with any equation **6**

$f(x,y,z,p,q)=0$, where f is homogeneous in x, y, z.

b) Find the complete integral of $z=p^2x+q^2y$, by Charpit's method. **6**

**OR**

c) Find the complete solution of **6**

$\left(x^2+y^2\right)\left(p^2+q^2\right)=1$.

d) Apply Charpit's method to solve $z^2=pqxy$. **6**

## UNIT – III

**3.** a) Solve $\left(D^3-7DD'^2-6D'^3\right)z=\sin(x+2y)$. **6**

b) Solve $\left(2D^2-DD'-3D'^2\right)z=5e^{x-y}$. **6**

**OR**

c) Solve $\left(D^2+5DD'+6D'^2\right)z=\frac{1}{y-2x}$ **6**

d) Solve $r+s-6t=y\cos x$. **6**

**UNIT – IV**

**4.** a) Show that the solution of a non-homogeneous DE $\left(aD+bD'+c\right)z=0$ is $z=e^{-cx/a}F\left(ay-bx\right), a\neq 0$. **6**

b) Solve $\left(D^2-D'\right)z=x\,e^{x+y}$. **6**

**OR**

c) Solve $x^2\frac{\partial^2 z}{\partial x^2}-y^2\frac{\partial^2 z}{\partial y^2}+x\frac{\partial z}{\partial x}-y\frac{\partial z}{\partial y}=0$. **6**

d) Reduce the equation $r=x^2\,t$ to canonical form. **6**

**5.** Solve **any six.**

a) Solve the differential equation $yzdx+zxdy+xydz=0$. **2**

b) Eliminating the arbitrary constant from equation. **2**
$z=ax+by+a^2+b^2$ obtain PDE.

c) Find the complete integral of $z=px+qy-2p-3q$. **2**

d) Write the condition of compatibility for the PDE. **2**
$f\left(x,y,z,p,q\right)=0$ and $g\left(x,y,z,p,q\right)=0$.

e) Solve $2r+5s+2t=0$. **2**

f) Find the particular integral of $\left(2D-3D'\right)z=e^{x-y}$ **2**

g) Solve $\left(D+2D'-3\right)z=0$. **2**

h) Classify the PDE. **2**
$y^2r-2xys+x^2t=\left(\frac{y^2}{x}\right)p+\left(\frac{x^2}{y}\right)q$.

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