B.Sc.-I (CBCS Pattern) Semester - II

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

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

Time : Three Hours * 1 7 1 8 * Max. Marks : 60

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Notes : 1. Solve all **five** questions.
2. Each questions carries equal marks.

**UNIT – I**

**1.** a) Obtain the partial differential equation of all spheres of radius 3 units having their centres in the xy plane. **6**

b) Solve **6**
$zdx + xz\cos y dy + x(1-z)(\log x + \sin y)dz = 0$

**OR**

c) Prove that equation $F(u,v)=0$ gives a partial differential equation of the form $Pp+Qq=R$, where F is an arbitrary function of independent functions $u=u(x,y,z)$ and $v=v(x,y,z)$ **6**

d) Find the general solution of the partial differential equation. **6**
$x^2p + y^2q = (x+y)z$

**UNIT – II**

**2.** a) Show that the equation $xp - yq = x$ and $x^2p + q = xz$ are compatible and find their solution. **6**

b) Solve $x^2p^2 + y^2q^2 = z^2$ **6**

**OR**

c) Solve $p^2 + q^2 = x^2 + y^2$ **6**

d) Solve by Charpit's method. **6**
$pxy + pq + qy = yz$

**UNIT – III**

**3.** a) Solve the DE **6**
$$\frac{\partial^2 v}{\partial x^2} + \frac{\partial^2 v}{\partial y^2} = -4\pi\left(x^2 + y^2\right)$$

b) Solve **6**
$$\frac{\partial^3 z}{\partial x^3} - 3\frac{\partial^3 z}{\partial x^2 \partial y} + 4\frac{\partial^3 z}{\partial y^3} = e^{x+2y}$$

**OR**

c) Solve **6**

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

d) Show that the complete integral of $f\left(u_x, u_y, u_z\right) = 0$ is **6**

$u = ax + by + \nu(a, b)z + c$

Where a, b, c are arbitrary constants and $f(a, b, \nu) = 0$

## UNIT – IV

**4.** a) Solve **6**

$$(D + 2D')(D - 2D' + 1)\left(D^2 + D + D'\right)z = 0$$

b) Solve **6**

$$\left(D^2 + DD' + D' - 1\right)z = e^{-x} + e^{2x-y}$$

**OR**

c) Solve **6**

$$x^2 \frac{\partial^2 z}{\partial x^2} - 4xy \frac{\partial^2 z}{\partial x \partial y} + 4y^2 \frac{\partial^2 z}{\partial y^2} + 6y \frac{\partial z}{\partial y} = x^3 y^4$$

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

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

a) Solve the DE $yzdx + zxdy + xydz = 0$ **2**

b) Obtain the PDE by eliminating arbitrary function of the equation z = f (x – y). **2**

c) Write condition of compatibility. **2**

d) Write Charpit's equation. **2**

e) Solve **2**

$$\frac{\partial^2 z}{\partial x^2} - \frac{\partial^2 z}{\partial y^2} = 0$$

f) Solve $\frac{1}{2D - 3D'} e^{x+y}$ **2**

g) Solve $(2D' - 3)z = 0$ **2**

h) Solve $(D + 2D' - 3)z = 0$ **2**

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