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

USMT04 - Mathematics Paper-II : Partial Differential Equations

P. Pages : 2 **GUG/W/22/11587**

Time : Three Hours * 2 2 3 6 * Max. Marks : 60

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

UNIT – I

1. a) State the condition of integrability. Solve $(x+z)^2\,dy + y^2(dx+dz) = 0$. **6**

b) Solve $\dfrac{dx}{x(y^2-z^2)} = \dfrac{dy}{-y(z^2+x^2)} = \dfrac{dz}{z(x^2+y^2)}$ **6**

OR

c) Obtain the general solution of $p + 3q = 5z + \tan(y-3x)$ **6**

d) Show that the equation $F(u,v) = 0$ gives a PDE of the form $Pp + Qq = R$ where F is an arbitrary function of independent function $u = u(x,y,z) \& v = v(x,y,z)$ **6**

UNIT – II

2. a) Show that the equations $z = px + qy$ and $2xy(p^2+q^2) = z(yp+xq)$ are compatible. Hence or otherwise solve these equations. **6**

b) Solve by Charpit's method $z^2 = pqxy$ **6**

OR

c) Obtain the complete solution of the PDE $F(x,p) = G(y,q)$ in the form **6**
$z = \int h(x,a)\,dx + \int k(y,a)\,dy + b$
Where a and b are arbitrary constants.

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

UNIT – III

3. a) Find a real function V of x and y, reducing to zero when y = 0 and satisfying **6**
$\dfrac{\partial^2 V}{\partial x^2} + \dfrac{\partial^2 V}{\partial y^2} = -4\pi(x^2+y^2)$

b) Solve: $\dfrac{\partial^2 z}{\partial x^2} - \dfrac{\partial^2 z}{\partial x \partial y} = \cos x \cos 2y$ **6**

OR

c) Solve $\left(D^2 - 2DD' - 8D'^2\right)z = \sqrt{2x+3y}$ **6**

d) Solve: $4r - 4s + t = 16\log(x+2y)$ **6**

UNIT – IV

4. a) Obtain the solution of a non homogenous D.E. **6**
$(aD + bD' + c)z = 0$

b) Solve $\left(D^2 + DD' + D' - 1\right)z = e^{-x}$ **6**

OR

c) Solve the equation. **6**

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

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

5. Solve **any six** questions.

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

b) Obtain the PDE from: **2**
$z = a(x+y) + b(x-y) + abt + c$

c) State the condition of compatibility for the equations **2**
$f(x, y, z, p, q) = 0 \,\&\, g(x, y, z, p, q) = 0$

d) Find the complete integral of pq = 1 **2**

e) Solve: $\left(D^3 - 4D^2D' + 4DD'^2\right)z = 0$ **2**

f) Find Particular integral of $\left(D^2 + 2D'^2\right)z = \sin(x+y)$ **2**

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

h) Find the particular integral of the equation $(D - D' - 2)z = e^{2x-y}$ **2**

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