Reg. No ..... Name **24P307**

M.Sc. DEGREE END SEMESTER EXAMINATION - OCTOBER 2024

SEMESTER 3 : MATHEMATICS

COURSE : **21P3MATT11 : PARTIAL DIFFERENTIAL EQUATIONS**

(For Regular 2023 Admission and Supplementary 2022/2021 Admissions)

Duration : Three Hours Max. Weights: 30

PART A

Answer any 8 questions **Weight: 1**

1. Classify the pde as elliptic, hyperbolic or parabolic $z_{xx} + z_{yy} = 0$. (U, CO 4)
2. Find the particular integral of $(D^3 - 2D^2D' - DD'^2 + 2D'^3)z = e^{x+y}$. (A, CO 3)
3. Solve $x_1p + x_2q = z$. (A, CO 1)
4. Show that the pdes $z = px_1 + qx_2$ and $f(x_1, x_2, z, p, q) = 0$ are compatible if $f(x_1, x_2, z, p, q) = 0$ is homogeneous in x_1, x_2, z. (A, CO 2)
5. Form pde by eliminating arbitrary function from $F(x_1x_2 + z^2, x_1 + x_2 + z) = 0$. (A, CO 1)
6. Find the complete integral of $(p + q)(z - px_1 - qx_2) = 1$. (A, CO 2)
7. Define complete integral. (R, CO 1)
8. Find the particular integral of $(r + s - 2t) = e^{x+y}$ (A, CO 3)
9. Classify the pde as elliptic, hyperbolic or parabolic $z_{xx} = -x^2z_{yy}$. (U, CO 4)
10. Find the complete integral of $p^2 = qz$. (A, CO 2)

(1 x 8 = 8)

PART B

Answer any 6 questions **Weights: 2**

11. Solve: $(r + s - 2t)z = e^{2x+y}$ (A, CO 3)
12. Solve $z(x_1p - x_2q) = x_2^2 - x_1^2$. (A, CO 1)
13. Solve $3r + 4s + t + (rt - s^2) = 1$ using Monge's method. (A, CO 4)
14. Show that the equations $p^2 + q^2 - 1 = 0, (p^2 + q^2)x_1 - pz = 0$ are compatible and find a one parameter family of common solutions. (An, CO 2)
15. Solve $x_1(x_2 - z)p + x_2(z - x_1)q = z(x_1 - x_2)$. (A, CO 1)
16. Find the complete integral of $2(z + px_1 + qx_2) = x_2p^2$. (An, CO 2)
17. Solve $(D^2 - D')z = e^{2x+y}$ (A, CO 3)
18. Solve $pq = x(ps - qr)$ using Monge's method. (A, CO 4)

(2 x 6 = 12)

PART C

Answer any 2 questions **Weights: 5**

19. Find the complete integral of the equation $p^2x_1 + x_2y = z$ and hence derive the equation of the integral surface which contains the line $x_2 = 1, x_1 + z = 0$. (An, CO 2)
20. Describe Monge's method and solve $r - tcos^2x + ptanx = 0$. (A, CO 4)

21. Show that the equation $(x_2^2 + x_2x_3)dx_1 + (x_1x_3 + x_3^2)dx_2 + (x_2^2 - x_1x_2)dx_3 = 0$ is integrable and find the integral. (An, CO 1)

22. Reduce to canonical form and solve the pde $r + 2s + t = 0$. (E, CO 3)

(5 x 2 = 10)

OBE: Questions to Course Outcome Mapping

CO	Course Outcome Description	CL	Questions	Total Wt.
CO 1	explain the classification of first order pde and their solutions	A	3, 5, 7, 12, 15, 21	12
CO 2	illustrate the integrals of nonlinear pde's	An	4, 6, 10, 14, 16, 19	12
CO 3	analyze linear pde with constant coefficients and special second order pde's	An	2, 8, 11, 17, 22	11
CO 4	analyze solutions of Laplace's equation	An	1, 9, 13, 18, 20	11

Cognitive Level (CL): Cr - CREATE; E - EVALUATE; An - ANALYZE; A - APPLY; U - UNDERSTAND; R - REMEMBER;