Reg. No .... Name **25P308**

MSc DEGREE END SEMESTER EXAMINATION - OCTOBER 2025

SEMESTER 3 : MATHEMATICS

COURSE : **24P3MATT11 : PARTIAL DIFFERENTIAL EQUATIONS**

(For Regular - 2024 Admission)

Time : Three Hours Max. Weights: 30

PART A

Answer any 8 questions **Weight: 1**

1. Define method of separation of variables. (U)
2. Find the complete integral of $zpq = p + q$. (A)
3. Find the particular integral of $r + 3s + 2t = x + y$. (A)
4. Solve $x_1p + x_2q = z$. (A)
5. Find a particular integral of $(D^2 - D')z = e^{2x+y}$. (A)
6. Find the complete integral of $pq = 1$. (A)
7. Show that the pdes $z = px_1 + qx_2$ and $f(x_1, x_2, z, p, q) = 0$ are compatible if the latter is homogeneous in x_1, x_2, z. (A)
8. Form pde by eliminating arbitrary function $z = x_1 + x_2 + F(x_1x_2)$. (A)
9. Classify the pde as elliptic, hyperbolic or parabolic $z_{xx} = z_y$. (U)
10. Eliminate the parameters a and b from the equation $z^2(1 + a^3) = 8(x_1 + ax_2 + b)^3$ to find the corresponding pde. (A)

(1 x 8 = 8)

PART B

Answer any 6 questions **Weights: 2**

11. Find the complete integral of $x_2zp^2 - q = 0$. (A)
12. Solve $(q + 1)s = (p + 1)t$ using Monge's method. (A)
13. Solve $q^2r - 2pqs + p^2t = 0$ using Monge's method. (A)
14. Find the complete integral of $(p^2 + q^2)x_2 = qz$. (An)
15. Consider the pde $f(x_1, x_2, z, p, q) = z - px_1 - qx_2 - p^2 - q^2 = 0$. Verify that $z = ax_1 + x_2 + a^2 + b^2$ is complete integral. Find the general integral such that $b = a$. Also find the singular integral. (A)
16. Solve: $(r + s - 2t)z = e^{2x+y}$ (A)
17. Let $z = F(x_1, x_2, a, b)$ be a two parameter family of solutions of the pde $f(x_1, x_2, z, p, q) = 0$. Then prove that the singular integral is also a solution of the pde. (A)
18. Solve $(D^2 - 2DD')z = e^{2x} + x^3y$ (A)

(2 x 6 = 12)

PART C

Answer any 2 questions **Weights: 5**

19. Prove that a necessary and sufficient condition for a Pfaffian differential equation $X.dr = 0$ to be integrable is that $X.curlX = 0$. (An)
20. State and prove Dirichlet problem for a rectangle. (A)

21. (i) Solve $r - t - 3p + 3q = xy + e^{x+2y}$ (An)
(ii) Solve $(D^3 - 2D^2D^1)z = 2e^{2x} + 3x^2y$

22. Show that the equations $x_1p - x_2q - x_1 = 0, x_1^2p + q - x_1z = 0$ are compatible on some domain. Find the domain and find a one parameter family of common solutions. (An)

(5 x 2 = 10)

OBE: Questions to Course Outcome Mapping

CO	Course Outcome Description	CL	Questions	Total Wt.

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

