



K24U 0883

Reg. No. :

Name :

IV Semester B.Sc. Honours in Mathematics Degree (C.B.C.S.S. – O.B.E. –
Regular/Supplementary/ Improvement) Examination, April 2024
(2021 and 2022 Admissions)

4B16 BMH : INTRODUCTION TO PARTIAL DIFFERENTIAL EQUATIONS

Time : 3 Hours

Max. Marks : 60

PART – A

Answer **any 4** questions out of 5 questions. **Each** question carries **one** mark.

1. Write Laplace equation.
2. Find the order and degree of the partial differential equation $\frac{\partial u}{\partial t} = u \frac{\partial^3 u}{\partial x^3} + \sin x$.
3. Give the Charpit's auxiliary equations for the PDE $f(x, y, z, p, q) = 0$.
4. Classify the PDE $y^2 u_{xx} - x^2 u_{yy} = 0$, $x > 0$, $y > 0$.
5. Solve $2r + 5s + 2t = 0$. (4×1=4)

PART – B

Answer **any 6** questions out of 9 questions. **Each** question carries **two** marks.

6. Find the differential equation of all spheres of fixed radius having their centres in xy – plane.
7. Find the partial differential equation by eliminating a and b from $z = (x + a)(y + b)$.
8. Find the complete integral of $p^2 + q^2 = npq$.
9. The complete integral of the PDE $p(1 + q^2) = q(z - c)$ is $4a(z - c) = (x + ay + b)^2 + 4$. What can you say about its singular integral ?
10. Solve $\frac{\partial z}{\partial x} + \frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial x \partial y} = 1$.

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11. Solve $xy \frac{\partial^2 z}{\partial x \partial y} = 1$.
12. Find the particular integral of $(D - 2D')(D - D')^2 z = e^{x+y}$.
13. Find the particular integral of $r - 2s + t = \sin(2x + 3y)$.
14. Solve $r + 2s + t + 2p + 2q + z = 0$. (6×2=12)

PART – C

Answer **any 8** questions out of 12 questions. **Each** question carries **four** marks.

15. Solve $p - 2q = 3x^2 \sin(y + 2x)$.
16. Solve $x^2(y - z)p + y^2(z - x)q = z^2(x - y)$.
17. Find the integral of the equation $(x - y)y^2p + (y - x)x^2q = (x^2 + y^2)z$ which passes through the curve $xz = a^3$, $y = 0$.
18. Find the complete integral of $(x + y)(p + q)^2 + (x - y)(p - q)^2 = 1$.
19. Using Charpit's method, find a complete integral of the partial differential equation $px + q^2y = z$.
20. Solve $zpy^2 = x(y^2 + z^2q^2)$.
21. Solve $s - t = \frac{x}{y^2}$.
22. Solve $r + (a + b)s + abt = xy$ using Monge's method.
23. Find a surface satisfying $r = 6x + 2$ and touching $z = x^3 + y^3$ along its section by the plane $x + y + 1 = 0$.
24. Solve $(D^2 + DD' + D' - 1)z = \sin(x + 2y)$.
25. Solve $(D^2 - 2DD' - 15D'^2)z = 12xy$.
26. Solve $r + s - 2t = \sqrt{2x + y}$. (8×4=32)



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PART – D

Answer **any 2** questions out of 4 questions. **Each** question carries **six** marks.

27. Find the general solution of the partial differential equation $(2xy - 1)p + (z - 2x^2)q = 2(x - yz)$ and also obtain the particular solution which passes through the line $x = 1$, $y = 0$.
28. Apply Jacobi's method to find the complete integral of $p_1x_1 + p_2x_2 = p_3^2$.
29. Solve $z(1 + q^2)r - 2pqzs + z(p^2 + 1)t - z^2(s^2 - rt) + 1 + p^2 + q^2 = 0$.
30. Solve $(D^2D' - 2DD'^2 + D'^3)z = \frac{1}{x^3}$. (2×6=12)