647510 **BSCmaMN352A-5C** **Seat No :________**

B.Sc. Semester - 5 (NEP-2020) Examination

Oct/Nov - 2025

MATH: Fundamentals of Partial Differential Calculus

(For Chemistry & Physics Students) (Minor-5)

Time: 2:00 Hours **Marks: 50**

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate marks.

Que.1 Answer any two out of three. (10)

(1) State and prove Euler's theorem for Homogeneous function of two variables. From this theorem deduce that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = n\frac{f(u)}{f^{'}(u)}$, Where Z is a homogeneous Function of x and y of degree n and Z = f(u).

(2) if f(x,y) = 0 then find formula of $\frac{dy}{dx} and \frac{d^2y}{dx^2}$.

(3) if u = $\sin^{-1}$(x-y) , x = 3t , y = $4t^3$ then find $\frac{du}{dt}$.

Que.2 Answer any two out of three. (10)

(1) State and prove Taylor's theorem for two variables.

(2) Find the maximum value of f(x,y,z)=xyz subject to the constraint 2x+2y+z=108.

(3) Find the least distance of the point on the plane ax+by+cz+d = 0 from the origin.

Que.3 Answer any two out of three. (10)

(1) Derive Charpit's method for finding the complete integral of a non linear partial differential equation.

(2) State all four standard forms of non linear partial differential equations of first order and solve: $p^2 + q^2 = x + y$.

(3) Solve the PDE $pxy + pq + qy - yz = 0$ by Charpit's method.

Que.4 Answer any two out of three. (10)

(1) Solve: $\frac{\partial^3 z}{\partial x^3} - 2\frac{\partial^3 z}{\partial x^2 \partial y} = 3x^2y$.

(2) Solve: $\frac{\partial^3 z}{\partial x^3} - 4\frac{\partial^3 z}{\partial x^2 \partial y} + 4\frac{\partial^3 z}{\partial x \partial y^2} = 2sin(3x + 2y)$.

(3) Solve: $q^2r - 2pqs + p^2t = 0$.

Que.5 Answer any two out of three. (10)

(1) if $z^3 - xz - y = 0$ $then\ find$ $\frac{\partial^2 z}{\partial x \partial y}$.

(2) if $u = \frac{yz}{x},\ v = \frac{zx}{y},\ \ w = \frac{xy}{z}$, then find $\frac{\partial(u,v,w)}{\partial(x,y,z)}$.

(3) Solve: Lagrange's Linear equation $(y + z)p - (z + x)q = (x - y)$.

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