647510 **BSCmaMJ204x-2C** **Seat No :_________**

B.Sc. Semester - 2 (NEP-2020) Examination
MARCH/APRIL-2026 (As Per Syllabus Year June-2025)
MATH: Partial Derivatives & Differential Geometry (Major-4)

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

Instructions:

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

Que.1(A) Answer any one question out of two. (05)

(1) if function Z=f(x,y) possesses the first order partial derivatives in the Domain D and x=g(t) , y=h(t) also possesses its first order partial derivatives
Then show that $\frac{dz}{dt} = \frac{\partial z}{\partial x}\frac{dx}{dt} + \frac{\partial z}{\partial y}\frac{dy}{dt}$

(2) if $u = e^{xyz}$ $then\ find$ $\frac{\partial^3 u}{\partial x \partial y \partial z}$

Que.1(B) Answer any one question out of two. (05)

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

(2) if u = $\sin^{-1}\frac{(x^{\frac{1}{4}}+y^{\frac{1}{4}})}{(x^{\frac{1}{5}}+y^{\frac{1}{5}})}$ $then\ show\ that$ $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \frac{1}{20}tanu.$

Que.2(A) Answer any one question out of two. (05)

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

(2) if $f(x,y) = x^3 + xy + y^3$ $then\ find\ approximate\ value\ of$ $f(1.01,2.98)$

Que.2(B) Answer any one question out of two. (05)

(1) if $\frac{4}{x} + \frac{9}{y} + \frac{16}{z} = 25$ then by lagrange's method obtain the value of x,y,z Which makes x+y+z minimum.

(2) Expand e^xsiny in power of x and y up to three degree by Taylor's Method.

Que.3(A) Answer any one question out of two. (05)

(1) Prove that the radius of curvature at any point (x,y) on the curve y=f(x) is $\frac{(1+{y^2}_1)^{\frac{3}{2}}}{y_2}$.

(2) Find radius of curvature at origin for the curve $x = a(\theta + sin\theta), y = a(1 - cos\theta)$

Que.3(B) Answer any one question out of two. (05)

(1) in usual notations derive radius of curvature for polar curves.

(2) Define radius of curvature and find radius of curvature at the origin for the Curve $x^2+2xy+2y^2-4x = 0$.

Que.4(A) Answer any one question out of two. (05)

(1) Obtain the oblique asymptotes of the general algebraic curve.

(2) Define concavity and convexity of the curve and also prove that y = e^x is Concave upward everywhere.

Que.4(B) Answer any one question out of two. (05)

(1) Find the position and nature of double points of the curve $x^4-2ay^3-3a^2y^2-2a^2x^2+a^4 = 0$.

(2) Find all asymptotes to the curve $y^3-6xy^2+11x^2y-6x^3+x+y = 0$.

Que.5(A) Answer any one question out of two. (05)

(1) Define Limit of two variable function and using definition find limit of Function f(x,y) = $\frac{y}{x}$ when (x,y) → (1,1).

(2) $if\ u = \frac{x+y}{1-xy}$ $, v = tan^{-1}x + tan^{-1}y\ then\ find$ $\frac{\partial(u,v)}{\partial(x,y)}$

Que.5(B) Answer any one question out of two. (05)

(1) if $r = acosn\theta$ $then\ prove\ that$ $\rho = \frac{a}{1+n^2}$ $at\ \theta = 0.$

(2) Find all asymptotes of the curve $x^2 - y^2 = a^2$

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