

B.Sc. Semester - 4 (NEP-2020) Examination
March/April-2026 (As Per Syllabus Year June-2024)
MATH: Advanced Calculus -2 (Major-9)

Time: 2:00 Hours

Marks: 50

Instructions:

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

Que.1 Answer any two. (10)

- (1) Form a partial differential equation by elimination of arbitrary function method from : $z = ax^2 + by^2$
- (2) Using Charpit's method, solve: $p^2 + q^2 = 1$
- (3) Define: Lagrange's partial differential equation and derive its auxiliary equation.

Que.2 Answer any two. (10)

- (1) Derive Monge's method for the second order partial differential equations.
- (2) Solve: $r + 2s + t = e^{2x+3y}$
- (3) Solve: $(D^2 - 2DD' + D'^2)z = 12xy$.

Que.3 Answer any two. (10)

- (1) Define: Laplace transform. Prove that:
 - (i) $L[\sinh at] = \frac{a}{s^2 - a^2}$, $s > |a|$
 - (ii) $L[\cosh at] = \frac{s}{s^2 - a^2}$, $s > 0$
- (2) Find Laplace transform of (i) $\cos^3 2t$ (ii) $\cosh^3 2t$.
- (3) If $L\{f(t)\} = \bar{f}(s)$ then prove that: $L\{e^{at}f(t)\} = \bar{f}(s - a)$. Using it find: $L[4 \cosh(3t) - 2 \sinh t]$.

Que.4 Answer any two. (10)

- (1) Find the inverse Laplace transform of $\frac{s+29}{(s+4)(s^2+9)}$.
- (2) State and prove convolution theorem for inverse Laplace transforms.
- (3) Solve: $y'' + 4y = 0$, $y(0) = 2$, $y'(0) = -8$.

Que.5 Answer any two. (10)

- (1) Solve: $(D^2 - 4D'^2)z = \cos 2x \cos 3y$.
- (2) Apply convolution theorem, to evaluate: $L^{-1} \left[\frac{s^2}{(s^2+a^2)(s^2+b^2)} \right]$.
- (3) Define: Inverse Laplace transform. Find the inverse Laplace transform of
 - (i) $\frac{s}{(s^2-1)^2}$
 - (ii) $\frac{s}{s^4+s^2+1}$
