647510 **BSCmaMJ209x-4C** **Seat No :_____**

B.Sc. Semester - 4 (NEP-2020) Examination
March/April-2025
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. Define: Lagrange's partial differential equation and derive its auxiliary equation.
2. Form a partial differential equation by elimination of arbitrary function method: $\varphi(x^2+y^2+z^2;\ z^2-2xy)=0$.
3. Using Charpit's method, solve: $(p^2+q^2)y=qz$

Que-2 Answer any two. (10)

1. Derive Monge's equations for non-linear equation of the second order for $R_r+S_s+T_t=V$
2. Using Monge's method, solve: $r-tcos^2x+ptanx=0$.
3. Solve: $\left(D^2+DD'-6D'^2\right)z=x^2\cos(x+y)$.

Que-3 Answer any two. (10)

1. Define: Laplace transform. Prove that:
$$L(t^n)=\frac{\Gamma(n+1)}{s^{n+1}};\ s>0, n>-1.$$
$$=\frac{n!}{s^{n+1}};n=0,1,2,3,\ldots$$
2. Find Laplace transform of $(i)sin2tcos3t \quad (ii)cosh^3 2t$.
3. If $L\{f(t)\}=\bar{f}(s)$ then prove that: $L\{e^{at}f(t)\}=\bar{f}(s-a)$. Using it find: $\{e^{-3t}sin^2t\}$.

Que-4 Answer any two. (10)

1. State and prove convolution theorem for inverse Laplace transforms.
2. Find the inverse Laplace transform of $(i)\frac{3s+5}{(s+1)^4} \quad (ii)\frac{s+7}{s^2+2s+2}$.
3. Solve: $y''+y=t, y(\pi)=0, y'(0)=1$.

Que-5 Answer any two. (10)

1. Solve: $(D^3-3D^2D')z=x^2y$.
2. Solve: $xp+yq=1$.
3. Define: Inverse Laplace transform. Find the inverse Laplace transform of $\frac{1}{s^3(s^2+a^2)}$.

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