

B.Sc. Semester - 2 (NEP-2020) Examination

MARCH/APRIL-2025

MATH: Theory of Ordinary Differential Equations (Multidisciplinary Course)

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) Find the solution of general linear differential equation of the type $\frac{dy}{dx} + Py = Q$. Also solve: $(x + 2y^3)\frac{dy}{dx} = y$.
 - (2) Solve: $(y^2 - 2xy)dx = (x^2 - 2xy)dy$
- Que-1(B) Answer any one question out of two. (05)
- (1) Explain method to find solution of Bernoulli's differential Equation.
 - (2) Solve: $\frac{dy}{dx} + \frac{y \cos x + \sin y + y}{\sin x + x \cos y + x} = 0$.
- Que-2(A) Answer any one question out of two. (05)
- (1) Solve: $y^2 p^2 - x^2 = 0$.
 - (2) Solve: $y^2 + p^2 = 1$.
- Que-2(B) Answer any one question out of two. (05)
- (1) Write general form of clairaut's differential equation and find it's solution.
 - (2) Solve: $y = 2px - \frac{1}{3}p^2$
- Que-3(A) Answer any one question out of two. (05)
- (1) Discuss the solution of auxiliary equation when two roots are Real and distinct.
 - (2) Solve: $(D^4 + 5D^2 - 36)y = 0$.
- Que-3(B) Answer any one question out of two. (05)
- (1) For the linear differential equation $f(D)y = X$, Where $X = \sin ax$, Prove that $\frac{1}{f(D^2)} \sin ax = \frac{1}{f(-a^2)} \sin ax$. Where $f(-a^2) \neq 0$.
 - (2) Find the particular integral of $(D^2 + 2D - 8)y = e^{3x}$.
- Que-4(A) Answer any one question out of two. (05)
- (1) Explain one of the methods for finding complementary function for a linear Differential equation with variable coefficients.
 - (2) Solve: $x^4 \frac{d^3 y}{dx^3} + 2x^3 \frac{d^2 y}{dx^2} - x^2 \frac{dy}{dx} + xy = 1$
- Que-4(B) Answer any one question out of two. (05)
- (1) Solve: $x^2 \frac{d^3 y}{dx^3} - 4x \frac{d^2 y}{dx^2} + 6 \frac{dy}{dx} = 4$
 - (2) Solve: $(x^3 D^3 + 2x^2 D^2 + 2)y = 10(x + \frac{1}{x})$
- Que-5(A) Answer any one question out of two. (05)
- (1) Find solution of $(x^4 - 2xy^2 + y^4)dx - (2x^2y - 4xy^3 + \sin y)dy = 0$ as exact differential equation.
 - (2) Solve: $y = p \sin p + \cos p$
- Que-5(B) Answer any one question out of two. (05)
- (1) Prove that $\frac{1}{D^2 + a^2} \cos ax = \frac{x}{2a} \sin ax$ and $\frac{1}{D^2 + a^2} \sin ax = \frac{-x}{2a} \cos ax$
 - (2) Solve: $(x^2 D^2 + xD - 1)y = x^m$
