

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

MARCH/APRIL-2026 (As Per Syllabus Year June-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 of the following questions. (05)
1. Solve: $e^y \left(\frac{dy}{dx} + 1 \right) = e^x$
 2. Solve: $(\sin x \sin y + \sec^2 x)dx + (\tan^2 y - \cos x \cos y)dy = 0$
- Que.1(B) Answer any one of the following questions. (05)
1. State and prove the necessary and sufficient conditions for a differential equation to be exact.
 2. Solve: $x \frac{dy}{dx} = y - \sqrt{y}$
- Que.2(A) Answer any one of the following questions. (05)
1. Solve: $y = 2px + y^2 p^3$
 2. Solve: $y = x + a \tan^{-1} p$
- Que.2(B) Answer any one of the following questions. (05)
1. Solve: $y^2 = xyp + \frac{y^3 p^3}{x^3}$
 2. Solve: $x^2(y - px) = yp^2$.
- Que.3(A) Answer any one of the following questions. (05)
1. Solve: $\frac{d^3 y}{dx^3} - 12 \frac{d^2 y}{dx^2} + 6 \frac{dy}{dx} - 8y = e^{2x}$.
 2. Solve: $(D^2 - 4D + 4)y = e^{-4x} + 5 \cos 3x$.
- Que.3(B) Answer any one of the following questions. (05)
1. Solve: $(D^2 + 4)y = \sin 2x$.
 2. Prove: $\frac{1}{D^2 + a^2} \cos ax = \frac{x}{2a} \sin ax$
 $\frac{1}{D^2 + a^2} \sin ax = \frac{-x}{2a} \cos ax$
- Que.4(A) Answer any one of the following questions. (05)
1. Solve: $x^3 y''' + 3x^2 y'' - 6xy' + 6y = \left(x^2 - \frac{1}{x^2}\right)^2$.
 2. Solve: $(xD^3 - D^2)y = \frac{1}{x}$
- Que.4(B) Answer any one of the following questions. (05)
1. Solve: $x^2 \frac{d^2 y}{dx^2} + 4x \frac{dy}{dx} + 2y = e^x$
 2. Solve: $x^3 y''' + 3x^2 y' + xy = \sin(\log x)$
- Que.5(A) Answer any one of the following questions. (05)
1. Find orthogonal trajectory for the family of curves $xy = c$.
 2. Solve: $y \left(\frac{dy}{dx} \right)^2 + (x - y) \frac{dy}{dx} - x = 0$
- Que.5(B) Answer any one of the following questions. (05)
1. Prove: $\frac{1}{f(D)} e^{ax} V = e^{ax} \frac{1}{f(D+a)} V$, where V is a function of x.
 2. Solve: $(3x + 2)^2 y'' + 3(3x + 2)y' - 36y = 3x^2 + 4x - 1$.
