647510 **BSCmaMD202x-2C** **Seat No :_____**

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

JUNE – 2024

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) State and prove the necessary and sufficient condition for a differential equation to be exact.

(2) Find the solution of general linear differential equation of type $\frac{dy}{dx} + Py = Q$. Also solve: $x^2 \frac{dy}{dx} = 3x^2 - 2xy + 1$.

Que.1(B) Answer any one of the following questions. (05)

(1) Solve: $\left(2 + 2x^2\sqrt{y}\right)ydx + \left(x^2\sqrt{y} + 2\right)xdy = 0.$

(2) Solve: $(x^2 + y^2 + x)dx + xydy = 0.$

Que.2(A) Answer any one of the following questions. (05)

(1) Solve: $y = 3px + 6y^2p^2.$

(2) Solve: $x = yp + p^2.$

Que.2(B) Answer any one of the following questions. (05)

(1) Solve: $p^2 + 2py\ \cot x - y^2 = 0.$

(2) Solve: $y = 3p + 4p^2.$

Que.3(A) Answer any one of the following questions. (05)

(1) Solve: $\frac{d^3y}{dx^3} - 12\ \frac{d^2y}{dx^2} + 6\frac{dy}{dx} - 8y = e^{2x}.$

(2) Prove that if $f(-a^2)\ \neq 0,$ then $\frac{1}{f(D^2)}\sin ax = \frac{1}{f(-a^2)}\sin ax.$

Que.3(B) Answer any one of the following questions. (05)

(1) Solve: $(D-2)^2y = \frac{e^{2x}}{x^2}.$

(2) Prove: $\frac{1}{f(D)}\ e^{ax}\ V = e^{ax}\frac{1}{f(D+a)}\ V$; where V is a function of x.

Que.4(A) Answer any one of the following questions. (05)

(1) Solve: $\left(D^2 - \frac{3}{x}\ D + \frac{3}{x^2}\right)y = 2x - 1.$

(2) Solve: $xy'' - (x+2)\ y' + 2y = 0.$

Que.4(B) Answer any one of the following questions. (05)

(1) Solve: $(2x+1)^2y'' - 2(2x+1)y' - 12y = 6x.$

(2) Solve: $(x+2)^2\ \frac{d^2y}{dx^2} - (x+2)\frac{dy}{dx} + y = 3x + 4.$

Que.5(A) Answer any one of the following questions. (05)

(1) Find the orthogonal trajectory of the family of curves $y = x - 1 + ce^{-x}.$

(2) Solve: $e^{4x}(p-1) + e^{2y}p^2 = 0.$

Que.5(B) Answer any one of the following questions. (05)

(1) Solve: $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 3y = \cos(5x+3).$

(2) Solve: $xy'' -\ y' + 4x^3y = 0.$

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