

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

JUNE – 2024

MATH: Theory of Ordinary Differential Equations (Major-3)

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: (05)

- (1) Solve: $\frac{dy}{dx} = (4x + y + 1)^2$ if $y(0) = 1$.
- (2) Solve: $(y^2 - 2xy)dx = (x^2 - 2xy)dy$.

Que.1(B) Answer any one: (05)

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

Que.2(A) Answer any one: (05)

- (1) Solve: $p^3 + 2xp^2 - y^2p^2 - 2xy^2p = 0$.
- (2) Solve: $y^2p^2 - 3xp + y = 0$.

Que.2(B) Answer any one: (05)

- (1) Write general form of Clairaut's differential equation also find its solution.
- (2) Solve: $p^2 - 6px + 3y = 0$.

Que.3(A) Answer any one: (05)

- (1) Define Auxiliary equation and discuss the solution of it when all the roots are real and distinct.
- (2) Find the general solution of the differential equation
 $\frac{d^2y}{dx^2} - 4 \frac{dy}{dx} + 3y = \cos(5x + 3)$

Que.3(B) Answer any one: (05)

- (1) Derive particular integral of the linear differential equation with constant coefficients $f(D)y = X$ when $X = e^{ax}$, $f(a) \neq 0$.
- (2) Solve: $(D^2 - 1)y = x^2 - 1$

Que.4(A) Answer any one: (05)

- (1) Explain one of the methods for finding Complementary function for a linear differential equation with variable constants.
- (2) Solve: $x^2 \frac{d^2y}{dx^2} + 2x \frac{dy}{dx} - 20y = (x + 1)^2$

Que.4(B) Answer any one: (05)

- (1) Solve: $x^3 \frac{d^3y}{dx^3} + 3x^2 \frac{d^2y}{dx^2} - 6x \frac{dy}{dx} + 6y = \left(x^2 - \frac{1}{x^2}\right)^2$
- (2) Solve: $(x^2 D^2 - 3xD + 4)y = x^m$

Que.5(A) Answer any one: (05)

- (1) Solve: $\frac{dy}{dx} + \frac{y \cos x + \sin x + y}{\sin x + x \cos y + x} = 0$.
- (2) Solve: $p^2 = (p - 1)y$.

Que.5(B) Answer any one: (05)

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