

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

JUNE – 2024

MATH: Theory of Ordinary Differential Equations (Minor-2)

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 out of two: (05)

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

(2) Solve: $y - x \frac{dy}{dx} = \sqrt{y^2 - x^2}$

Que.1(B) Answer any one out of two: (05)

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

(2) Explain method to find solution of Bernoulli's differential equation.

Que.2(A) Answer any one out of two: (05)

(1) Solve: $yp^2 + (x-y)p - x = 0$

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

Que.2(B) Answer any one out of two: (05)

(1) State general form of Clairaut's differential equation. Also find its solution.

(2) Solve: $e^{3x} (p-1) + p^3 e^{2y} = 0$.

Que.3(A) Answer any one out of two: (05)

(1) Solve: $(D^4 - 2D^3 + 5D^2 - 8D + 4)y = 0$.

(2) Solve: $(D^4 + 5D^2 - 36)y = 0$.

Que.3(B) Answer any one out of two: (05)

(1) In usual notation, prove that $\frac{1}{f(D)} e^{ax} = \frac{1}{f(a)} e^{ax}$ if $f(a) \neq 0$.

(2) Solve: $(D^3 - 12D^2 + 6D - 8)y = e^{2x}$.

Que.4(A) Answer any one out of two: (05)

(1) Solve: $(x^2 D^2 + 7xD + 5)y = x^5$.

(2) Solve: $(x^2 D^2 - 2xD + 2)y = x^3$.

Que.4(B) Answer any one out of two: (05)

(1) Solve: $(x^3 D^3 + 2x^2 D^2 + 2)y = 0$.

(2) Solve: $(x^2 D^2 - xD + 1)y = 2 \log x$.

Que.5(A) Answer any one out of two: (05)

(1) Solve: $(2xy + y - \tan y)dx + (x^2 - x \tan^2 y + \sec^2 y)dy = 0$

(2) Find integrating factor for $(x^2 y - 2x y^2)dx + (3x^2 y - x^3)dy = 0$ and hence find its solution.

Que.5(B) Answer any one out of two: (05)

(1) In usual notation, prove that $\frac{1}{f(D^2)} \sin(ax) = \frac{1}{f(-a^2)} \sin(ax)$; $f(-a^2) \neq 0$.

(2) Find $\frac{1}{D^2 + D + 1} \sin 2x$.
