Second Year ( B.Sc )

Math-2108

(Mathematics Specialization)

Ordinary Differential Equations

Time Allowed: (3) hours

**Answer All Questions.**

1.(a) Find explicit particular solution of the initial value problem $x\dfrac{dy}{dx} - y = 2x^2 y$, $y(1) = 1$.

(b) Find the general solution of the differential equation

$(x^2 + 1)\dfrac{dy}{dx} + 3x^3 y = 6x\exp\left(-\dfrac{3}{2}x^2\right)$, $y(0) = 1$. Find the corresponding particular solution.

2.(a) Solve the initial value problem $x\dfrac{dy}{dx} = y + \sqrt{x^2 - y^2}$, $y(x_0) = 0$, where $x_0 > 0$.

(b) Find the general solution for Bernoulli equation $2xe^{2y}\dfrac{dy}{dx} = 3x^4 + e^{2y}$.

3.(a) Verify that the differential equation $\left(e^x \sin y + \tan y\right)dx + \left(e^x \cos y + x\sec^2 y\right)dy = 0$ is exact and solve it.

(b) Solve the equation $y'' = 2y(y')^3$.

4.(a) Solve the initial value problem $y'' + y' - 6y = 0$, $y(0) = 7, y'(0) = -1$.

(b) Solve the initial value problem $y^{(3)} + 9y' = 0$, $y(0) = 3, y'(0) = -1, y''(0) = 2$.

5.(a) Find the particular solution $y_p$ of the differential equation $4y'' + 4y' + y = 3xe^x$.

(b) Find the particular solution $y_p$ of the differential equation $y^{(3)} + y'' = 3e^x + 4x^2$.

6.(a) Determine the appropriate form for a particular solution of the differential equation $y^{(3)} - y'' - 12y' = x - 2xe^{-3x}$.

(b) Solve the initial value problem of $y'' + y = \cos x$; $y(0) = 1, y'(0) = -1$.

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