For question **1** to **4**, please choose the correct answer.

1. From the differential equations given, which one has second order, second degree.

   [a] $3y''+2y'=0$

   [b] $\left(\dfrac{d^2y}{dx^2}\right)^2+\dfrac{dy}{dx}=3x$

   [c] $\left(\dfrac{dy}{dx}\right)^2+y=1$

   [d] $\dfrac{d^2y}{dx^2}=2x$

2. From the differential equations given, which one is a nonlinear equation?

   [a] $xy''+x^2y=0$

   [b] $\dfrac{d^2y}{dx^2}=\sin x$

   [c] $\dfrac{1}{2}y'''+xy^2=e^x$

   [c] $\dfrac{dy}{dt}+2ty=-\cos t$

3. By using direct integration, integrate $\dfrac{dy}{dt}=\dfrac{2}{3t+1}$.

   [a] $y=\dfrac{2}{3}\ln|3t+1|+c$

   [b] $y=2\ln|3t+1|+c$

   [c] $y=\dfrac{3}{2}\ln|3t|+c$

   [d] $y=\dfrac{2}{3}\ln|3x+1|+d$

4. Which one is a separable equation?

   [a] $x\dfrac{dy}{dx}=4x+y$

   [b] $2y\dfrac{dy}{dt}=\dfrac{3y+t}{t}$

   [c] $\dfrac{dy}{dt}=e^y+t^2$

   [c] $e^x\dfrac{dy}{dx}=e^{x+2y}$

   [4 Marks]

5. By using the definition of linearity, write one example of linear differential equation.

[2 Marks]

6. Solve the given differential equation.

$$t\frac{dx}{dt} = \frac{x}{x^2+1}$$

[4 Marks]