# Chapter 9: Differential Equations

## Ex-9.1

**Determine order and degree (if defined) of differential equations given in Questions 1 to 10:**

**Q1.** $\frac{d^4y}{dx^4} + \sin(y') = 0$

**A.1.** The highest order derivation present in the differential equation (D.E.) is $\frac{d^4y}{dx^4}$, so its order is 4.

As, the given D.E.is not a polynomial equation in its derivative ,its degree is not defined.

**Q2. y' + 5y = 0**

**A.2.** The highest order derivation present in the D.E. is y , so its order is 1.

As the given D.E. is a polynomial equation in its derivative its degree is 1.

**Q3.** $\left(\frac{ds}{dt}\right)^4 + 3s\frac{d^2s}{dt^2} = 0$

**A.3.** The highest order derivation present in the D.E. is $\frac{d^2s}{dt^2}$ so its order is 2 .

As the given D.E. is a polynomial equation in its derivative its degree is 1.

**Q4.** $\frac{d^2y}{\left(dx^2\right)^2} + \cos\left(\frac{dy}{dx}\right) = 0$

**A.4.** $\frac{d^4y}{dx^4}$ As the given D.E. is not a polynomial equation in its derivative, its degree is not defined.

**Q5.** $\frac{d^2y}{dx^2} = \cos 3x + \sin 3x$

**A.5.** $\frac{d^4y}{dx^4}$ As the given D.E. is a polynomial equation in its derivative, its degree is 1.

**Q6. $(y''') + (y'') + (y')^4 + y^5 = 0$**

**A.6.** The highest order derivative present in the D.E. is $y'''$ so its order is 3.

As the given D.E. is a polynomial equation in its derivation , its degree is 2.

**Q7.** $y''' + 2y'' + y' = 0$

**A.7.** The highest order present in the D.E. is $y'''$ so its order is 3.

As the given D.E. is a polynomial equation in its derivative, its degree is 1.

**Q8.** $y' + y = e^x$

**A.8.** The given order derivative present in the D.E. is $y'$ so its order is 1.

As the given D.E. is a polynomial equation in its derivative, its degree is 1.

**Q9.** $y'' + (y')^2 + 2y = 0$

**A.9.** The highest order derivative present in the D.E. is $y''$ so its order is 2.

As the given D.E. is a polynomial equation in its derivative, its degree is 1.

**Q10.** $y'' + 2y' + \sin y = 0$

**A.10.** The highest order derivative present in the D.E. is $y''$ so its order is 2.

As the given D.E. is polynomial equation in its derivative, its degree is 1.

**Q11. The degree of the differential equation $\left(\frac{d^2y}{dx^2}\right)^3 + \left(\frac{dy}{dx}\right)^2 + \sin\left(\frac{dy}{dx}\right) + 1 = 0$ is:**

**(A) 3**

**(B) 2**

**(C) 1**

**(D) Not defined**

**A.11.** In the given D.E,

$\sin\frac{dy}{dx}$ is a trigonometric function of derivative $\frac{dy}{dx}$. So it is not a polynomial equation so its derivative is not defined.

Hence, Degree of the given D.E. is not defined.

$\therefore$ Option (D) is correct.

**Q12. The order of the differential equation $2x^2\frac{d^2y}{dx^2}-3\frac{dy}{dx}+y=0$ is:**

**(A) 2**

**(B) 1**

**(C) 0**

**(D) Not defined**

**A.12.** The highest order derivative present in the given D.E. is $\frac{d^2y}{dx^2}$ and its order is 2.

$\therefore$ Option (A) is correct.