# QUIZ

# HIGHER ORDER DIFFERENTIAL EQUATION

**PART 1: LINEAR DIFFERENTIAL EQAUTION**

## **MCQS**

1. Which of the following represents a linear third-order non-homogeneous differential equation?

A) 2*y*′′′+2*y*′′−*y*′=*x*2

B) *y*′′′−2*y*′′+*y*′=0

C) *y*′′′+*y*′′+*y*′=*ex*

D) *y*′′′=cos(*x*)

**ANSWER: C) *y*′′′+*y*′′+*y*′=*ex***

1. What is the order of the following linear differential operator: D3+2D2−D+1?

A) 1

B) 2

C) 3

D) 4

**ANSWER: C) 3**

1. dy/dx + ycosx = sinx is both a differential equation and an ordinary differential equation

1) True

2) False

**ANSWER: 1)TRUE**

1. Which of the following is a characteristic of a higher-order differential equation?

a) It involves derivatives of higher order

b) It involves only first-order derivatives

c) It involves only second-order derivatives

d) It involves integrals instead of derivatives

**ANSWER: a) It involves derivatives of higher order**

5)Which of the following statements best describes the superposition principle in linear homogeneous differential equations?

A) It states that the solution to a differential equation can be obtained by superimposing multiple non-linear functions.

B) It asserts that any linear combination of solutions to a linear homogeneous differential equation is also a solution.

C) It suggests that only one solution can exist for a given linear homogeneous differential equation.

D) It implies that the solutions to a differential equation cannot be combined to form new solutions

**ANSWER: B) It asserts that any linear combination of solutions to a linear homogeneous differential equation is also a solution.**

**FILL IN THE BLANK**

1. The general solution of distinct real root is ­­­­­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**ANSWER:**

1. A \_\_\_\_\_\_\_\_\_\_\_\_\_ is an operator that maps a function to its derivatives, and it satisfies the linearity property.

**Answer: linear differential operator**

1. The order of (𝑑^2 𝑦)/(𝑑𝑥^2 ) + 𝑥𝑦〖(𝑑𝑦/𝑑𝑥)〗^2=0 is \_

**ANS: 2**

1. The solution to a boundary value problem is determined by specifying conditions at multiple points within the domain, while an initial value problem is determined by specifying conditions at \_\_\_ point(s).
2. In a linear homogeneous differential equation, if 𝑦₁(𝑥) and 𝑦₂(𝑥) are solutions, then any linear combination 𝑎𝑦₁(𝑥) + 𝑏𝑦₂(𝑥) is also a solution, where \_ and \_ are constants."

**Ans :a and b**

## **SHORT QUESTION ANSWER**

1. What is the general solution of linear nth order differential equation?

## **ANSWER**

The general form of nth order differential equation is



Where an (x), an\_ 1 (x), , al (x), ao(x) Are function x representing the coefficient F(x) is the non-homogeneous term (if present) and y is the dependent variable

1. Write down the expression for differential operator of order n.

**Answer: A = f (D) = a0Dn + a1Dn-1 + …. + an-1D + an**

1. find the order and degree of d²u/dx² + d²u/dy² + d²u/dz² = 0

**ANS: order 2, degree 1**

1. For the linear ordinary differential equation:

(d^2 y)/(dx^2 ) - 2dy/dx + y = 0

if y1(x) = e^x and y2(x) =e^-x are solutions, find the solution y(x) resulting from the superposition of y1(x) and y2(x)

**ANSWER:** To find the solution y(x) resulting from the superposition of y1(x) and y2(x), we simply add the individual solutions:y(x) = y1(x) + y2(x) = e^x + e^-x

1. **What are the characteristics of a linear higher-order differential equation?**

* The characteristics of a linear higher-order differential equation include:
  + Linearity: The equation is linear in *y* and its derivatives.
  + Order: It involves derivatives up to some order *n*.
  + Coefficients: The coefficients may be constants or functions of the independent variable *x*.
  + Homogeneity: If the non-homogeneous term *F*(*x*) is absent, the equation is homogeneous; otherwise, it is non-homogeneous.