SSR Degree & PG College (Autonomous), Nizamabad

UG Semester–I Internal-I Mathematics

Course: Differential Equations Question Bank

Part – A: Multiple Choice Questions (20 × 1 Mark)

1. A differential equation contains:
   - A) Only variables
   - B) Derivatives of dependent variables
   - C) Constants only
   - D) Integrals only

   Answer: B
2. The order of a differential equation is determined by the:
   - A) Degree of the equation
   - B) Highest order derivative
   - C) Number of variables
   - D) Number of constants

   Answer: B
3. The degree of a differential equation is defined only when:
   - A) It is free from radicals and fractions involving derivatives
   - B) It contains constants
   - C) It is linear
   - D) It is homogeneous

   Answer: A
4. $\frac{dy}{dx} = 3x^2$ is a differential equation of:
   - A) First order
   - B) Second order
   - C) Third order
   - D) Zero order

   Answer: A
5. The equation $\frac{dy}{dx} = f(x)$ is solved by:
   - A) Integration
   - B) Differentiation
   - C) Elimination
   - D) Substitution

   Answer: A
6. Variables are separated in:
   - A) Linear equations
   - B) Separable equations
   - C) Exact equations
   - D) Bernoulli equations

   Answer: B

7. The general solution of a first-order differential equation contains:
    - A) One arbitrary constant
    - B) Two arbitrary constants
    - C) Three arbitrary constants
    - D) No constant

    Answer: A
8. $\frac{dy}{dx} + Py = Q$ is called:
    - A) Exact equation
    - B) Linear differential equation
    - C) Homogeneous equation
    - D) Bernoulli equation

    Answer: B
9. The integrating factor (I.F.) of $\frac{dy}{dx} + Py = Q$ is:
    - A) $e^{\int P dx}$
    - B) $e^{\int Q dx}$
    - C) P+Q
    - D) PQ

    Answer: A
10. A differential equation having variables separable can be solved by:
    - A) Multiplication
    - B) Separation of variables
    - C) Elimination
    - D) Laplace transform

    Answer: B
11. The solution satisfying given conditions is called:
    - A) General solution
    - B) Particular solution
    - C) Singular solution
    - D) Complete integral

    Answer: B
12. The equation $\frac{dy}{dx} = xy$ is:
    - A) Separable
    - B) Exact
    - C) Linear
    - D) Both A and C

    Answer: D
13. The independent variable is usually represented by:
    - A) (x)
    - B) (y)
    - C) (z)
    - D) (u)

    Answer: A
14. The dependent variable is generally represented by:
    - A) (x)
    - B) (y)
    - C) (a)
    - D) (t)

    Answer: B

15. The order of $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + y = 0$ is:
    - A) 1
    - B) 2
    - C) 3
    - D) 4

    Answer: B
16. The degree of $(\frac{d^2y}{dx^2})^3 + \frac{dy}{dx} = 0$ is:
    - A) 1
    - B) 2
    - C) 3
    - D) 4

    Answer: C
17. The solution of a differential equation represents:
    - A) A constant
    - B) A relation between variables
    - C) A matrix
    - D) A determinant

    Answer: B
18. A first-order linear differential equation has:
    - A) One dependent variable
    - B) One independent variable
    - C) Both A and B
    - D) Neither

    Answer: C
19. An arbitrary constant is generally denoted by:
    - A) (k)
    - B) (C)
    - C) (P)
    - D) (Q)

    Answer: B
20. The solution obtained after applying the initial condition is called:
    - A) General solution
    - B) Particular solution
    - C) Complementary function
    - D) Auxiliary equation

    Answer: B

Part – B: Fill in the Blanks

1. An equation involving derivatives is called a **differential equation**.
2. The highest order derivative determines the **order** of a differential equation.
3. The degree is defined only when the equation is **free from radicals and fractional powers of derivatives**.
4. A solution containing arbitrary constants is called the **general solution**.
5. A solution satisfying the initial conditions is called the **particular solution**.
6. Variables can be separated in **separable differential equations**.
7. The integrating factor of $\frac{dy}{dx} + Py = Q$ is $\underline{\boldsymbol{e^{\int P dx}}}$.

8. A first-order linear differential equation has the form $\frac{dy}{dx} + Py = Q$.
9. The independent variable is usually denoted by **(x)**.
10. The dependent variable is usually denoted by **(y)**.
11. Integration is the inverse process of **differentiation**.
12. The solution of a differential equation contains **arbitrary constants**.
13. A differential equation of first order contains the **first derivative**.
14. The process of solving a separable equation involves **integration**.
15. Initial conditions are used to obtain the **particular solution**.
16. The order of $\frac{dy}{dx} = x + y$ is **one**.
17. A linear differential equation has degree **one**.
18. The coefficient of $\frac{dy}{dx}$ in the standard linear equation is **1**.
19. The integrating factor simplifies the equation into an **exact differential**.
20. Differential equations are widely used in **science and engineering**.

Part – C: Descriptive Questions

1. **Define a differential equation.**
2. **Solve the differential equation by the method of separation of variables:** $\frac{dy}{dx} = x(1 + y)$
3. **Solve the first-order linear differential equation:** $\frac{dy}{dx} + 2y = e^{-x}$
4. **Define a differential equation solvable for p.**
5. **Define Homogeneous Function.**