CUET (UG) – MATHEMATICS

Chapter Test - Differential Equations (Order, Degree, and Variable Separable)

General Instructions

1. Total Questions: **20**

2. Duration: **60 Minutes**

3. All questions are compulsory.

4. Each question carries **5 marks**.

5. For each correct answer: **+5 marks**.

6. For each incorrect answer: **-1 mark**.

7. No negative marking for unanswered questions.

8. Use of calculator or electronic devices is strictly prohibited.

9. Choose the most appropriate answer from the given options.

1. The order and degree of the differential equation $\left[1 + \left(\frac{dy}{dx}\right)^2\right]^{3/2} = \frac{d^2y}{dx^2}$ are respectively:
   (A) 2, 2
   (B) 2, 3
   (C) 2, 1
   (D) 1, 2

2. The degree of the differential equation $\frac{d^2y}{dx^2} + \sin\left(\frac{dy}{dx}\right) = 0$ is:
   (A) 2
   (B) 1
   (C) 0
   (D) Not defined

3. The order of the differential equation of all circles of fixed radius r in a plane is:
   (A) 1
   (B) 2
   (C) 3
   (D) 4

4. The general solution of the differential equation $\frac{dy}{dx} = e^{x+y}$ is:
   (A) $e^x + e^y = C$
   (B) $e^x + e^{-y} = C$
   (C) $e^{-x} + e^y = C$
   (D) $e^x - e^{-y} = C$

5. The solution of $\frac{dy}{dx} = \frac{1+y^2}{1+x^2}$ is:
   (A) $\tan^{-1} y + \tan^{-1} x = C$
   (B) $\tan^{-1} y - \tan^{-1} x = C$
   (C) $x + y = C(1 - xy)$
   (D) $y - x = C(1 + xy)$

6. The number of arbitrary constants in the general solution of a differential equation of fourth order is:
   (A) 0
   (B) 2
   (C) 4
   (D) 8

7. The solution of $\frac{dy}{dx} = \sqrt{1 - y^2}$ is:
   (A) $\sin^{-1} y = x + C$
   (B) $\cos^{-1} y = x + C$
   (C) $\sin^{-1} x = y + C$
   (D) $\tan^{-1} y = x + C$

8. The differential equation representing the family of curves $y = e^x(A\cos x + B\sin x)$ is of order:
   (A) 1
   (B) 2
   (C) 3
   (D) 4

9. Integrating $\frac{dy}{dx} = \frac{x(2\log x + 1)}{\sin y + y\cos y}$ leads to:
   (A) $y\sin y = x^2 \log x + C$
   (B) $y\cos y = x^2 \log x + C$

(C) $y \sin y = x \log x + C$

(D) $\sin y = x^2 + C$

10. The differential equation representing the family of parabolas having vertex at origin and axis along the positive direction of the x-axis is:

(A) $y^2 = 4ax$

(B) $2x\frac{dy}{dx} = y$

(C) $y\frac{dy}{dx} = 2x$

(D) $2y\frac{dy}{dx} = x$

11. The degree of the differential equation $\sqrt{\frac{d^2y}{dx^2}} = \sqrt[3]{\frac{dy}{dx} + 3}$ is:

(A) 2

(B) 3

(C) 6

(D) 1

12. The general solution of $\frac{dy}{dx} = \frac{1+y}{1-x}$ $(x \neq 1, y \neq -1)$ is:

(A) $(1+y)(1-x) = C$

(B) $\frac{1+y}{1-x} = C$

(C) $\log(1+y)\log(1-x) = C$

(D) $(1+y) + (1-x) = C$

13. The solution of the differential equation $e^x \tan y \, dx + (1 - e^x) \sec^2 y \, dy = 0$ is:

(A) $\tan y = C(1 - e^x)$

(B) $\tan y = C(e^x - 1)$

(C) $\tan x = C(1 - e^y)$

(D) $\sec^2 y = C(1 - e^x)$

14. If $\frac{dy}{dx} = 1 + x + y + xy$ and $y(0) = 0$, then y is equal to:

(A) $e^{x^2/2+x} - 1$

(B) $e^{x^2/2} - 1$

(C) $\log(x+1) - 1$

(D) $e^x - 1$

15. The order and degree of the differential equation $\frac{d^2y}{dx^2} = \sqrt{1 + \left(\frac{dy}{dx}\right)^2}$ are:

(A) 2, 2

(B) 2, 1

(C) 1, 2

(D) 1, 1

16. Which of the following differential equations is separable?

(A) $\frac{dy}{dx} = \frac{x+y}{x-y}$

(B) $\frac{dy}{dx} = \sin(x+y)$

(C) $\frac{dy}{dx} = e^{x-y}$

(D) $\frac{dy}{dx} + \frac{y}{x} = x^2$

17. The solution of $\frac{dy}{dx} + \sqrt{\frac{1-y^2}{1-x^2}} = 0$ is:

(A) $\sin^{-1} y + \sin^{-1} x = C$

(B) $\sin^{-1} y - \sin^{-1} x = C$

(C) $\sin^{-1}(xy) = C$

(D) $x\sqrt{1-y^2} + y\sqrt{1-x^2} = C$

18. The number of arbitrary constants in the particular solution of a differential equation of second order is:
    (A) 0
    (B) 1
    (C) 2
    (D) 3

19. The solution of the differential equation $\frac{dy}{dx} = \frac{y}{x}$ is:
    (A) $y = x + C$
    (B) $y = Cx$
    (C) $xy = C$
    (D) $y = \log x + C$

20. The order and degree of $\left(\frac{d^3y}{dx^3}\right)^2 - 3\frac{d^2y}{dx^2} + 2\left(\frac{dy}{dx}\right)^4 = y$ are respectively:
    (A) 3, 2
    (B) 2, 3
    (C) 3, 4
    (D) 4, 3

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