REV-01
BSM/06/16

2023/12

SET A

B.SC. MATHEMATICS
THIRD SEMESTER
DIFFERENTIAL EQUATION
BSM – 304 IDMJ

[USE OMR FOR OBJECTIVE PART]

Duration: 3 hrs. **Full Marks: 70**

Objective

Time: 30 min. **Marks: 20**

Choose the correct answer from the following: ***1X20=20***

1. What is the degree of the differential equation

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

a. 1 b. 2
c. 3 d. 4

2. What is the degree of the differential equation

$$\frac{d^3y}{dx^3} + \cos\left(\frac{d^2y}{dx^2}\right) = 0$$

a. 2 b. 1
c. 3 d. Not defined

3. $y' + y = \frac{5}{y'}$ has degree

a. 1 b. 2
c. Not defined d. 4

4. The order of a differential equation whose general solution is $y = A\sin x + B\cos x$ is

a. 4 b. 2
c. 0 d. 3

5. A solution which can be obtained from a general solution is called

a. Particular solution b. Singular solution
c. Unique solution d. None

6. The differential equation $y' + 3y = x$ is

a. Linear b. Homogeneous
c. Exact d. None

7. The solution of $\frac{dy}{dx} = e^{x+y}$ is

a. $e^x + e^y = c$
b. $e^x + e^{-y} = c$
c. $e^x - e^y = c$
d. None

8. The differential equation $y' = xy, y(1) = 1$ has

a. Infinite solution
b. No solution
c. Unique solution
d. Two solutions

9. The integrating factor of $\frac{dy}{dx} + y = x$ is

a. e^x
b. e^{-x}
c. e^{x^2}
d. None

10. The integrating factor of $\frac{dy}{dx} + \frac{y}{x} = x$ is

a. $\log x$
b. $-x$
c. x
d. None

11. Equation $(x^2 + y^2)dx - 2xydy = 0$ is exact?

a. True
b. False
c. Cannot be defined
d. Neither True nor False

12. $Pdx + x \sin y dy = 0$ is exact, then P is

a. $\sin y + \cos y$
b. $-\sin y$
c. $\cos y$
d. $x^2 - \cos y$

13. For what value of k, $(x^3 + 3xy^2)dx + (kx^2y + y^3)dy = 0$ is an exact?

a. 3
b. 6
c. 2
d. None

14. Complemetary function of $\frac{d^2y}{dx^2} - 2y = \sin x$ is

a. $Ae^{\sqrt{2}x} + Be^{-\sqrt{2}x}$
b. $Ae^{\sqrt{2}x} - Be^{-\sqrt{2}x}$
c. $Ae^{2x} + Be^{-2x}$
d. None

15. Particular integral of $y'' - y = \sin x$ is

a. $\frac{\sin x}{2}$ b. $-\frac{\sin x}{2}$

c. $\frac{\sin x}{4}$ d. $-\frac{\sin x}{4}$

16. Complementary function of $y'' + y = e^x$ is

a. $A\cos x - B\sin x$ b. $Ae^x + Be^{-x}$

c. $Ae^x - Be^{-x}$ d. $A\cos x + B\sin x$

17. The number of arbitrary constants in the solution of the equation $y''' + 2y'' + 5y' - 3y = 0$ are

a. 1 b. 2

c. 3 d. 4

18. The equation $\frac{dy}{dx} = \frac{x^2 + y^2}{xy}$ is

a. Homogeneous b. Linear

c. Second order d. None

19. The solution of the equation $yy' = x$ is

a. $x^2 + y^2 = c$ b. $x - y = c$

c. $x + y = c$ d. $x^2 - y^2 = c$

20. The solution of the equation $2xy' - y = 0; y(1) = 2$ represents

a. Straight line b. Parabola

c. Circle d. Ellipse

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(Descriptive)

Time : 2 hrs. 30 min. **Marks : 50**

[Answer question no.1 & any four (4) from the rest]

1. Find the differential equation of the family of curves **5+5=10**

   (a) $y = Ae^{kx} + Be^{-kx}$

   (b) $xy = Ae^{x} + Be^{-x}$

   for different values of A and B.

2. Solve the differential equations **5+5=10**

   (a) $\left(x^2 + y^2\right)dx + 2xydy = 0$

   (b) $\dfrac{dy}{dx} = \dfrac{3x+2y}{2x-3y}$

3. Find the differential equation of **5+5=10**

   (a) $ax^2 + by^2 = 1$

   (b) $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2} = 1$

4. Solve the differential equations **5+5=10**

   (a) $\left(x^2 + 2xy^2\right)dx + \left(2x^2y + y^2\right)dy = 0$

   (b) $\left(1 + e^{x/y}\right)dx + e^{x/y}\left(1 - e^{x/y}\right)dy = 0$

5. Solve the differential equations **5+5=10**

(a) $\frac{dy}{dx} - 2y\tan x = y^2\tan^2 x$

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

6. Solve. $4xp^2 - 8yp - x = 0$ **10**

7. Solve: $x - yp = ap^2$ **10**

8. Solve: **5+5=10**

(a) $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 4y = x^3$

(b) $\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = e^{4x}$

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