

**Faculty of Science**  
**B.Sc (Mathematics) I-Year, CBCS –II Semester**  
**Regular Examinations –June/July, 2022**  
**PAPER: Differential Equations**

Time: 3 Hours

Max Marks: 80

**Section-A**I. Answer any *eight* of the following (8x4=32 Marks)

1. Solve  $(e^y + 1) \cos x \, dx + e^y \sin x \, dy = 0$
2. Solve  $(x^2 - y^2)dx + 2xydy = 0$
3. Solve the differential equation  $(x^2 - 2xy - y^2) dx - (x + y)^2 dy = 0$
4. Solve  $p^2 - 7p + 12 = 0$
5. Solve the lagrange's equation  $y = p^2x + p^4$
6. Solve  $p = \log(px - y)$  (clairaut's form)
7. Solve  $\frac{d^3y}{dx^3} - \frac{dy}{dx} = 0$
8. Solve  $y''' - y'' - y' + y = 0$
9. Solve the differential equation  $\frac{d^2y}{dx^2} + \frac{dy}{dx} + y = x^2$
10. Solve the Cauchy Ealer equation  $x^2 \frac{d^2y}{dx^2} - 2x \frac{dy}{dx} + 2y = 4x^3$
11. Use method of variation of parameter to solve  $y'' + y = \operatorname{cosec} x$
12. By eliminations the arbitrary function F, obiter the partial differential equation form  $F(x^2 + y^2, z - xy) = 0$

**Section-B**

II. Answer the following questions (4x12=48 Marks)

- 13.(a) (i) Define Bernoulli's differential equation and solve it.  
(ii) Solve  $x \frac{dy}{dx} + 2y = x^2 \log x$  (Hint: Lagrange's equation)  
(OR)  
(b) Solve the differential equations  
 $(x^3 y^3 + x^2 y^2 + xy + 1)ydx + (x^3 y^3 - x^2 y^2 - xy + 1)x \, dy = 0$   
(Hint: Equation of the form  $yf_1(xy)dx + xf_2(xy)dy = 0$ )
- 14.(a) Solve  $xy^2(p^2 + 2) = 2py^3 + x^3$  (Hint: Equation solvable for p)  
(OR)  
(b) (i) Explain the method of solving clairaut's equation.  
(ii) Solve the clairaut's equation  $y = px - e^p$
- 15.(a) (i) Solve  $y'' + y' + 4y = 2 \sinh x$   
(ii) Solve  $y'' - 2y' - 3y = 3$   
(OR)  
(b) Solve  $y'' + 2y' + y = xe^{-x} + \sin x$  using method of undetermined coefficients.
- 16.(a) Solve  $x^2 y'' - 6y = 5x^3 + 8x^2$  (Hint: use  $x = e^t$ )  
(OR)  
(b) Solve  $x^2 y'' - 4xy' + 6y = 0$  given that  $y_1 = x^2$  is a solution.

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## Faculty of Science

## B.Sc(Mathematics)I-Year, CBC-II Semester Backlog Examinations –Jan, 2023

## PAPER: Differentia Equations

Time: 3 Hours

Max Marks: 80

## Section-A

I. Answer any *eight* of the following questions. (8x4=32 Marks)

1. Solve  $(x+y)^2 \frac{dy}{dx} = a^2$
2. Solve  $(xy^2 + x)dx + (yx^2 + y)dy = 0$
3. Solve  $x \frac{dy}{dx} + 2y = x^2 \log x$
4. Solve  $P^2 - 7P + 12 = 0$
5. Convert the equation  $\sin px \cos y = \cos px \sin y + p$  into clairaut's equation and solve it.
6. Solve  $x^2 + Px = yP$
7. Solve  $\frac{d^3y}{dx^3} - \frac{dy}{dx} = 0$
8. Solve  $y''' - y'' - 4y' + 4y = 0$
9. Solve the differential equation  $\frac{d^2y}{dx^2} + 2a \frac{dy}{dx} + y = x^2$
10. Use method of variation of parameter to solve  $y'' + y = \operatorname{cosec} x$
11. By eliminating the arbitrary function  $F$ , obtain the partial differential equation from  $F(x^2 + y^2, z - xy) = 0$
12. Solve equation  $x^2 \frac{d^2y}{dx^2} - 2x \frac{dy}{dx} + 2y = 4x^3$

## Section - B

II. Answer the following questions. (4x12=48 Marks)

13. (a) Solve the differential equation  $(x^3y^3 + x^2y^2 + xy + 1) ydx + (x^3y^3 - x^2y^2 - xy + 1) xdy = 0$   
(OR)  
(b) (i) Define Bernoulli's differential equation and solve it.  
(ii) Solve  $x \frac{dy}{dx} + 2y = x^2 \log x$
14. (a) Solve  $xy^2(P^2 + 2) = 2Py^3 + x^3$   
(OR)  
(b) (i) Explain the method of solving Clairaut's equation.  
(ii) Solve the Clairaut's equation  $y = px - e^p$
15. (a) Solve  $y'' + 2y' + y = x\bar{e}^{-x} + \sin x$  using method of undetermined coefficients.  
(OR)  
(b) (i) Solve  $y'' + y' + 4y = 2\sin hx$   
(ii) Solve  $y'' - 2y' - 3y = 3$
16. (a) Solve  $x^2y'' - 6y = 5x^3 + 8x^2$ . (Hint: Use  $x = e^t$ )  
(OR)  
(b) Solve  $x^2y'' - 4xy' + 6y = 0$  given that  $y_1 = x^2$  is a solution.

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## Faculty of Science

## B.Sc(Mathematics)I-Year, CBCS-II Semester Regular Examinations –June, 2023

## PAPER: Differential Equations

Time: 3 Hours

Max Marks: 80

## Section-A

I. Answer any *eight* of the following questions. (8x4=32 Marks)

1. Solve  $x^2 y dx - (x^3 + y^3) dy = 0$
2. Solve  $(x + y)^2 \frac{dy}{dx} = a^2$
3. Solve  $(e^y + 1) \cos x dx + e^y \sin x dy = 0$
4. Solve  $P = \log(Px - y)$
5. Solve  $P^2 - 7P + 12 = 0$
6. Solve  $x^2 + Px = yP$
7. Solve the equation  $y''' - y'' - 4y' + 4y = 0$
8. Solve  $\frac{d^2 y}{dx^2} - 2a \frac{dy}{dx} + a^2 y = 0$
9. Solve  $\frac{d^5 y}{dx^5} - 10 \frac{d^3 y}{dx^3} + 9 \frac{dy}{dx} = 0$
10. Use method of variation of parameter to solve  $y'' + y = \operatorname{cosec} x$
11. Solve the Cauchy Euler equation  $x^2 \frac{d^2 y}{dx^2} - 2x \frac{dy}{dx} + 2y = 4x^3$
12. By eliminating the arbitrary function  $F$ , obtain the partial differential equation from  $F(x^2 + y^2, z - xy) = 0$

## Section - B

II. Answer the following questions. (4x12=48 Marks)

- 13.(a) Solve  $x \frac{dy}{dx} + y = xy^3$   
(OR)  
(b) Solve the differential equation  $(x^3 y^3 + x^2 y^2 + xy + 1) y dx + (x^3 y^3 - x^2 y^2 - xy + 1) x dy = 0$
- 14.(a) Solve  $x(1 + P^2) = 1$   
(OR)  
(b) Solve  $xy^2(P^2 + 2) = 2Py^3 + x^3$
- 15.(a) Solve  $(D^2 - 4D + 4)y = x^2 + e^x + \sin 2x$   
(OR)  
(b) Solve  $y'' + 2y' + y = xe^{-x} + \sin x$  using method of undetermined coefficients.
- 16.(a) Solve  $x^2 y'' - 4xy' + 6y = 0$  given that  $y_1 = x^2$  is a solution.  
(OR)  
(b) Solve the equation  $x^2 \frac{d^2 y}{dx^2} - x \frac{dy}{dx} + 2y = x \log x$ .

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