

Second Semester B.Sc. Degree Examination, September 2020

(CBCS Scheme)

Mathematics

Paper 2.1 - DIFFERENTIAL EQUATIONS

Time : 3 Hours]

[Max. Marks : 90

Instructions to Candidates : Answer all the Parts.

PART - A

I. Answer any **SIX** of the following : (6 × 2 = 12)

1. Solve : $x \frac{dy}{dx} - 2y = 2x$.

2. Solve : $xdy - ydx + 2x^3dx = 0$.

3. Find the complementary function of $(D^2 + 4)y = \sin 2x$.

4. Solve : $y'' - 8y' + 16y = 0$.

5. Define Cauchy's Homogeneous differential equations of order 'n'.

6. Find the part of complimentary function of the equation

$$x^2y'' = (x^2 + 2x)y' + 2(1 + x)y = x^3.$$

7. Solve : $P = e^q$.

8. Solve : $[D^3 - 7D(D')^2 + 6(D')^2]z = 0$.

PART - B

II. Answer any **SIX** of the following : (6 × 3 = 18)9. Verify the equation : $(1 + e^{x/y})dx + e^{x/y}(1 - x/y)dy = 0$, for exactness.10. Find the orthogonal trajectories of the curve cardioid $r = a(1 - \cos \theta)$.

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11. Solve : $\frac{d^2y}{dx^2} + \frac{dy}{dx} + y = \sin 2x$.
12. Define Wronskian of u and v where u and v are functions of x , hence find the Wronskian of $\sin 2x$ and $\cos 2x$.
13. Verify condition of integrability of the equation
 $3x^2 dx + 3y^2 dy - (x^3 + y^3 + e^{2z}) dz = 0$.
14. Solve : $x \frac{dx}{y^2 z} = \frac{dy}{zx} = \frac{dz}{y^2}$.
15. Form a partial differential equation from the relation $z = xy + y\sqrt{x^2 - a^2} + b$.
16. Solve : $x(1+y)p = y(1+x)q$.

PART - C

III. Answer any **THREE** of the following : **(3 × 5 = 15)**

17. Solve : $(x^4 + y^4) dx - xy^3 dy = 0$.
18. Solve for x , $y - 2px + yp^2 = 0$.
19. Find the general and singular solution of $(y - px)(p - 1) = p$.
20. Show that orthogonal trajectories of family $x^2 + 2y^2 = c$ is $y = ax^2$.

IV. Answer any **THREE** of the following : **(3 × 5 = 15)**

21. Solve : $\frac{d^2y}{dx^2} + 5 \frac{dy}{dx} + 6y = (e^x + 1)^2$.
22. Solve : $\frac{d^2y}{dx^2} + 3 \frac{dy}{dx} + 2y = \cos^2 x$.
23. Solve : $\frac{d^2y}{dx^2} + 2 \frac{dy}{dx} + y = 2x + x^2$.
24. Solve : $(D^2 - 6D + 9)y = e^{3x}(x^2 + 7x + 5)$.

V. Answer any **THREE** of the following :

(3 × 5 = 15)

25. $x^2 \frac{d^2y}{dx^2} - x \frac{dy}{dx} + 4y = \cos(\log x) + x \sin(\log x).$

26. Solve : $x^2y'' + xy' - 9y = 0$, given that x^3 is the part of complementary function.

27. Solve $y'' + a^2y = \tan ax$, by the method of variation of parameters.

28. Solve : $\cos x \frac{d^2y}{dx^2} + \sin x \frac{dy}{dx} - 2y \cos^3 x = 2 \cos^5 x$, by changing the independent variable.

VI. Answer any **THREE** of the following :

(3 × 5 = 15)

29. Solve : $(3x + y - z)p + (x + y - z)q = 2(z - y).$

30. Solve : $9(p^2z + q^2) = 4.$

31. Find the complete integral of $pxy + pq + qy = yz$, by Charpits method.

32. Solve : $2 \frac{\partial^2 z}{\partial x^2} - \frac{\partial^2 z}{\partial x \partial y} - 3 \frac{\partial^2 z}{\partial y^2} = 5e^{x-y}.$

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