

Second Semester B.Sc. Degree Examination, April/May 2019

(CBCS Scheme)

Mathematics

Paper 2.1 — DIFFERENTIAL EQUATIONS

Time : 3 Hours]

[Max. Marks : 90

Instructions to Candidates : Answers **ALL** the questions.

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

1. Find the integrating factor of  $\frac{dy}{dx} + y \sec x = \tan x$ .

2. Solve :  $p^2 + 5p + 6 = 0$

3. Find the complementary function of  $(D^2 + 4D + 4) y = 0$ .

4. Find the particular integral of  $(D^2 + 5D + 6) y = e^{-3x}$ .

5. Define Cauchy-Euler Homogenous differential equation of order 'n'.

6. Find a part of complementary function of

$$x \frac{d^2 y}{dx^2} - (2x + 1) \frac{dy}{dx} + (x + 1) y = x^2 e^x$$

7. Solve :  $\sqrt{p} + \sqrt{q} = 1$

8. Find the particular integral of  $[D - D']^2 z = e^{x+y}$ .

II. Answer any **SIX** of the following. (6 × 3 = 18)

9. Define Clairauts equation and find the general solution of  $y + p^2 = xp + 1$ .

10. Find the orthogonal Trajectories of the family of curves  $r = e^{a\theta}$ .

11. Define Wronskian and find the Wronskian of  $U = \sinh x$  and  $V = \cosh x$ .

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12. Solve :  $D^2y = \sin 3x + e^{4x}$ .

13. Verify the condition of integrability of  
 $(yz + 2x) dx + (zx - 2z) dy + (xy - 2y) dz = 0$

14. Solve :  $\frac{dx}{y^2} = \frac{dy}{x^2} = \frac{dz}{x^2y z^2}$

15. Solve :  $p^2 + q^2 = x + y$

16. Solve :  $z = px + qy + (p^2 + q^2)$

III. Answer any **THREE** of the following.

**(3 × 5 = 15)**

17. Test for exactness and solve :

$$(5x^4 + 3x^2y^2 - 2xy^3) dx + (2x^3y - 3x^2y^2 - 5y^4) dy = 0$$

18. Solve :  $\frac{dy}{dx} - 2y \tan x = y^2 \tan^2 x$

19. Find the general and singular solution of

$$y = px + \sin^{-1} p$$

20. Find the orthogonal trajectory of  $ay^2 = x^3$ .

IV. Answer any **THREE** of the following.

**(3 × 5 = 15)**

21. Solve :  $(D^3 - 1)y = (e^x + 1)^2$

22. Solve :  $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = \cos^2 x$

23. Solve :  $(D^2 + 2D + 1) y = x^2 + 1$

24. Solve :  $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 4y = e^x \cos x$

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

**(3 × 5 = 15)**

25. Solve :  $\frac{d^2y}{dx^2} + \frac{1}{x} \frac{dy}{dx} = \frac{12 \log x}{x^2}$

26. 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.

27. Solve :  $\frac{d^2y}{dx^2} + y = \operatorname{cosec} x$  by the method of variation of parameter.

28. Solve :  $\frac{dx}{y-z} = \frac{dy}{z-x} = \frac{dz}{x-y}$

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

**(3 × 5 = 15)**

29. Form a partial differential equation by Eliminating  $\phi$  from  $lx + my + nz = \phi(x^2 + y^2 + z^2)$ .

30. Solve :  $(x^2 - yz)p + (y^2 - zx)q = z^2 - xy$

31. Using Charpit's method solve :  $z = p^2 + qy$

32. Solve :  $[D^2 - 2DD' + (D')^2] z = 12xy$

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