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TRIVANDRUM

Fifth Semester B.Sc. Degree Examination, February 2021

First Degree Programme Under CBCSS

Mathematics

Core Course VIII

MM 1544 : DIFFERENTIAL EQUATIONS

(2018 Admission - Regular)

Time : 3 Hours Max. Marks : 80

SECTION – I

Answer **all** the questions.

1. The order of the differential equation $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = e^x$ is

2. Form the differential equation having for it general solution $y = ax$ where a and b any constant.

3. The equation $\frac{dy}{dx} + py = Q$ is called

4. Define exact equation.

5. Define particular solution of a differential equation.

6. Integrating factor of the equation $\frac{dy}{dx} - y \cot x = 2x \sin x$ is

P.T.O.

7. A differential equation $Mdx + Ndy = 0$ is exact if

8. Form the differential equation that represents all Parabolas each of which has a latus rectum 4a and whose axes are parallel to the x –axis.

9. Find out the Wronskain of e^x and e^{-x}.

10. Define a singular solution of a differential equation.

(10 × 1 = 10 Marks)

SECTION – II

Answer any **eight** questions.

11. Verify that the following are the solution of the corresponding differential equation.

$y = mx + c : \frac{d^2y}{dx^2} = 0$.

12. Form the differential equation by eliminating α and β from $(x-\alpha)^2 + (y-\beta)^2 = r^2$.

13. Find out the general solution of $xdx + ydy = 0$.

14. Solve $ydx - xdy + 3x^2y^2e^{x^3}dx = 0$.

15. Solve $y' = (y/x) + tan(y/x)$.

16. Solve $\frac{dy}{dx} + y\cos x = 1/2 \sin x$.

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

18. Solve $P^2 + \left(x + y - \frac{2y}{x}\right)P + xy + \frac{y^2}{x^2} - y - \frac{y^2}{x} = 0$.

19. Solve $y = 2Px + y^2P^3$.

20. Define Wronskain.

21. Define variation of Parameter in second order ODE.

22. Solve $y''+y = \sec x$ by variation of parameters.

23. Solve $\left(D^2 + DD' - 2D'^2\right) z = 0$.

24. Solve $\left(D^4 - D'4\right) z = 0$.

25. Find the orthogonal trajections of the family of curves given by $r = a \sin\theta$.

26. Write the general solution of $(y - Px)(P - 1) = P$.

(8 × 2 = 16 Marks)

SECTION – III

Answer any **six** questions.

27. Solve $\frac{dy}{dx} = \frac{6x - 4y + 3}{3x - 2y + 1}$.

28. Solve $x\,dx + y\,dy - \left(\frac{x\,dy - y\,dx}{x^2 + y^2}\right) = 0$.

29. Verify whether $e^y dx + \left(xe^y + 2y\right)dy = 0$ is exact if so solve.

30. Solve $\left(1 + y^2\right)dx + \left(x - \tan^{-1} y\right)dy = 0$.

31. Given that $y = x$ is a particular solution of the differential equation $x^2 y^n - 2x(1+x)y' + 2(1+x)y = x^3$. Find its general solution.

32. Solve $P\sqrt{x} + q\sqrt{y} = \sqrt{z}$.

33. Solve $\left(D^2 - 4\right) = e^{2x} + e^{-4x}$.

34. Find the Particular integral of $\left(D^2 - 4D + 3\right)y = e^x \cos 2x$.

35. Apply the method of variation of Parameter to solve $y''+3y'+2y = x^2$.

36. By the method of variation of Parameter solve $\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 9y = e^{2x}$.

37. Find the general solution of $zp + x = 0$.

38. Find the equation of the system of orthogonal trajectories of the Parabola $r = \frac{2a}{1+\cos\theta}$ where a is the parameter.

(6 × 4 = 24 Marks)

SECTION – IV

Answer any **two** questions.

39. Solve $\frac{dy}{dx} = \frac{y^3 + 3x^2y}{x^3 + 2xy^2}$.

40. Solve $(2xy^4e^y + 2xy^3 + y)dx + (x^2y^4e^y - x^2y^2 - 3x)\,dy = 0$.

41. Solve $(1+y^2)\,dx + (x - \tan^{-1}y)\,dy = 0$.

42. (a) Solve $(D^2 - 4D + 4)y = 3x^2e^{2x}\sin 2x$.

    (b) Solve $(D^2 - 6D + 13)y = 2^x$.

43. Find the orthogonal trajectories of the family of curves $\frac{x^2}{a^2} + \frac{y^2}{b^2+c} = 1$ where C is the parameter.

44. (a) By the method of variation of parameter solve $\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 9y = \frac{e^{3x}}{x^2}$.

    (b) Find the general solution of $P + 3q = 5z + \tan(y - 3x)$.

(2 × 15 = 30 Marks)
