Reg. No. : ....

Name : ....

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

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.

<div align="right">(10 × 1 = 10 Marks)</div>

<div align="center">SECTION – II</div>

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 $ydx - xdy + 3x^2y^2e^x dx = 0$.

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.

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<div align="right">K – 3292</div>

21. Define variation of Parameter in second order ODE.

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

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

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

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

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

<div align="right">(8 × 2 = 16 Marks)</div>

<div align="center">SECTION – III</div>

Answer any **six** questions.

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

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

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

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

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

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

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

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

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

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

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

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

(6 × 4 = 24 Marks)

SECTION – IV

Answer any **two** questions.

39. Solve $\dfrac{dy}{dx} - \dfrac{y^3 - 3x^2y}{x^3 - 2xy^2}$.

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

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 $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2 + c} = 1$ where C is the parameter.

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

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

(2 × 15 = 30 Marks)

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