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S – 1633

Reg. No. : .....

Name : .....

Fifth Semester B.Sc. Degree Examination, December 2023

First Degree Programme Under CBCSS

Mathematics

Core Course

MM 1544 – DIFFERENTIAL EQUATIONS

(2018 Admission Onwards)

Time : 3 Hours

Max. Marks : 80

SECTION – I

Answer **all** the questions.

1. Define order of an ordinary differential equation.

2. Give an example for an exact differential equation.

3. Integrating factor of $Mdx + Ndy = 0$ is _____.

4. A first-order ordinary differential equation is _____. if it can be brought into the form $y' + p(x)y = r(x)$.

5. Define an autonomous ordinary differential equation.

6. Give an example for homogenous linear order differential equation of second order.

7. Find a general solution of equation $y'' - y = 0$.

P.T.O.

8. Define singular solution of a differential equation.

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

10. Verify that the function $y = 2(1+\cos x)$ is a solution of $y'' + y = 2$.

(10 × 1 = 10 Marks

SECTION – II

Answer **any eight** questions.

11. Solve $y' = -2xy,\ y(0) = 1.8$.

12. Solve $2xydx + x^2dy = 0$.

13. Verify the differential equation $\cos(x+y)dx + (3y^2 + 2y + \cos(x+y))dy = 0$ is exac or not.

14. Find an equation of a curve with x-interpret 1 and whose tangent line at an point (x, y) has slope xe^y.

15. Find a general solution of $y' - y = 5.2$.

16. Verify by substitution that the functions $y = \cos x$ and $y = \sin x$ are solutions of th differential equation $y'' + y = 0$.

17. Solve $y'' - 4y = 0$.

18. Find a differential equation of the form $y'' + ay' + by = 0$ for which the function e^{2x}, e^{-2x} form a basis.

19. Solve $x^2y'' - 2y = 0$.

20. Check whether the functions $x + 4, -3x - 12\ (x > 0)$ are linearly dependent or not.

21. Find $(D - 3I)^2 e^{-x}$.

22. Find a second-order homogenous linear ordinary differential equation for whic $y = A\cos 5x + B\sin 5x$ is a general solution.

(8 × 2 = 16 Marks

SECTION – III

Answer **any six** questions.

23. Solve $2xy\ y' = y^2 - x^2$.

24. Under what conditions for the constants a, b, k, l is $(ax + by)\,dx + (kx + ly)\,dy = 0$ exact? Solve the exact ordinary differential equation.

25. Solve the initial value problem $y' + y\tan x = \sin 2x,\ y(0) = 1$.

26. Find the orthogonal trajectories of family of ellipses $\frac{1}{2}x^2 + y^2 = c$.

27. Show that for a second order homogenous linear differential equation, any linear combination of two solutions on an open interval I is again a solution of the differential equation on I.

28. Solve the initial value problem $y'' - 3y' - 4y = 0,\ y(0) = 2,\ y'(0) = 1$.

29. Find a general solution of $y'' + 5y' + 6y = 2e^{-x}$.

30. Factor $P(D) = D^2 - 3D - 40I$ and solve $P(D)y = 0$.

31. Solve $x^2y'' - 5xy' + 9y = 0$.

(6 × 4 = 24 Marks)

SECTION – IV

Answer **any two** questions.

32. (a) Find an integrating factor and solve the initial value problem $\left(e^{x+y} + ye^y\right) + \left(xe^y - 1\right)dy = 0,\ y(0) = 1$.

(b) Solve $(-\sin x \tan y + 1)dx + \cos x\ \sec^2 y\ dy = 0$.

33. (a) Solve $y' + y = -x/y$.

(b) Solve $y' = (y + 4x)^2$.

34. (a) Find a general solution of $y'' + 4y' + 4y = e^{-x}\cos x$.

(b) Find a general solution of $y'' + 3y' + 2y = 12x^2$.

35. (a) Solve $y'' + y = \sec x$.

(b) Solve the non homogenous linear ordinary differential equation by variation of parameters $y'' - 4y' + 5y = e^{2x}\,\text{cosec}\,x$.

(2 × 15 = 30 Marks)
