SWOT INSTITUTE
DIFFERENTIAL EQUATIONS (CLASS – XII)

1 Mark Questions

1. Write the integrating factor of the following differential equation

   $(1 + y^2) + (2xy - \cot y)\frac{dy}{dx} = 0$.

2. Find the solution of the differential equation $\frac{dy}{dx} = x^3 e^{-2y}$.

4 Marks Questions

3. Find the particular solution of the differential equation $\frac{dy}{dx} = 1 + x + y + xy$, given that y = 0 when x = 1.

4. Find the particular solution of the differential equation $x\frac{dy}{dx} - y + x\,\text{cosec}\left(\frac{y}{x}\right) = 0$ or $\frac{dy}{dx} - \frac{y}{x} + \text{cosec}\left(\frac{y}{x}\right) = 0$, given that y = 0, when x = 1.

5. Find the general solution of the differential equation $(x - y)\frac{dy}{dx} = x + 2y$.

6. Find the particular solution of the differential equation $\left\{x\sin^2\left(\frac{y}{x}\right) - y\right\}dx + x\,dy = 0$, given that $y = \frac{\pi}{4}$, when x = 1.

7. Solve the following differential equation

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

8. Find the particular solution of the differential equation $x(1 + y^2)\,dx - y(1 + x^2)dy = 0$, given that y = 1, when x = 0.

9. Find the particular solution of the differential equation $\log\left(\frac{dy}{dx}\right) = 3x + 4y$ equation, given that y = 0, when x = 0.

10. Solve the differential equation

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

11. Solve the following differential equation

    $x\cos\left(\frac{y}{x}\right)\frac{dy}{dx} = y\cos\left(\frac{y}{x}\right) + x;\ x \neq 0$.

12. Solve the differential equation

$x\frac{dy}{dx} + y = x.\cos x + \sin x$, given $y\left(\frac{\pi}{2}\right) = 1$.

13. $\frac{dy}{dx} + y \sec x = \tan x$.

14. $x(x^2 - 1)\frac{dy}{dx} = 1$, $y = 0$, when $x = 2$.

15. Solve the following differential equation

$(1 + x^2)\,dy + 2xy\,dx = \cot x\,dx$, where $x \neq 0$.

16. Find the particular solution of the differential equation

$(1 + e^{2x})\,dy + (1 + y^2)e^x\,dx = 0$, given that $y = 1$, when $x = 0$.

17. Solve the following differential equation

$(y + 3x^2)\frac{dx}{dy} = x$.

18. Solve the following differential equation

$xdy - (y + 2x^2)\,dx = 0$

19. Solve the following differential equation

$xdy + (y - x^3)\,dx = 0$

20. Show that the following differential equation is homogenous and then solve it.

$y\,dx + x \log\left|\frac{y}{x}\right| dy - 2x\,dy = 0$.

21. Solve the following differential equation.

$$\left(x\cos\frac{y}{x} + y\sin\frac{y}{x}\right)y - \left(y\sin\frac{y}{x} - x\cos\frac{y}{x}\right)\frac{dy}{dx} = 0$$

22. Solve the following differential equation

$(x^2 + 1)\frac{dy}{dx} + 2xy = \sqrt{x^2 + 4}$

23. Solve the following differential equation

$(x^3 + x^2 + x + 1)\frac{dy}{dx} = 2x^2 + x$

24. Solve the following differential equation, $\cos^2 x\frac{dy}{dx} + y = \tan x$.

25. Solve the following differential equation $\sec x\frac{dy}{dx} - y = \sin x$.

26. Solve the following differential equation

$x\frac{dy}{dx} = y - x\tan\left(\frac{y}{x}\right)$

6 Marks Questions

27. Solve the following differential equation

$\sqrt{1+x^2+y^2+x^2y^2}+xy\frac{dy}{dx}=0$.

28. Show that the differential equation

$\frac{dy}{dx}=\frac{y^2}{xy-x^2}$ is homogenous and also solve it.

29. Find the particular solution of the differential equation $(\tan^{-1}y - x)\, dy = (1 + y^2)\, dx$, given that x = 1 when y = 0.

30. Show that the differential equation

$\left[x\sin^2\left(\frac{y}{x}\right)-y\right]dx+xdy=0$ is homogenous. Find the particular solution of this differential equation, given that $y = \frac{\pi}{4}$, when x = 1.

31. Find the particular solution of the differential equation $\frac{dx}{dy} + x \cot y = 2y + y^2 \cot y$, $y \neq 0$), given that x = 0, when $y = \frac{\pi}{2}$.

32. Find the particular solution of the differential equation $(\tan^{-1}y - x)\, dy = (1 + y^2)dx$, given that x = 0, when y = 0.