SIVS 189 A-2K14
B.A./B.Sc. IVth Semester Degree Examination
Mathematics
(Differential Equation - I)
Paper - 4.2

Time : 3 Hours

Instructions to Candidates:
Answer all Sections.

Section - A

Answer any TEN of the following.

1. Solve:
   \((e^x + 1) \cos x \, dx + e^x \sin x \, dy = 0\)

2. Show that the Equation
   \((ax + hy + g) \, dx + (hx + by + f) \, dy = 0\) is exact.

3. Solve:
   \((x + y + 1) \frac{dy}{dx} = 1\)

4. Find the general and singular solution of \(y = Px + \frac{a}{P}\)

5. Solve: \(P^2 - 5P + 6 = 0\)

6. Find the complementary function of \((D^3 - D^2 - D - 2) \, y = 0\)

7. Solve: \((D^3 - 4) \, y = x^2\)

8. Solve: \(x^2 \frac{d^2 y}{dx^2} + x \frac{dy}{dx} - 4y = x^2\)

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9. Find the part of the complementary function of \( y'' - \cot x \cdot y' - (1 - \cot x) y = 0 \).

10. Find the complete solution of \( \frac{dy}{dx} - 3 \frac{dy}{dx} + 2y = x^2 e^{3x} \).

11. Find the Wronskian \( w \) of the equation \( y'' + y = \sec x \).

12. Show that the equation \( (2x^2 + 3x) \frac{d^2 y}{dx^2} + (6x + 3) \frac{dy}{dx} + 2y = (x + 1)e^x \) is exact.

Answer any three of the following (3x5=15)

13. Solve : \( (x^2 + 2y^2) dx - xy \, dy = 0 \)

14. Solve : \( x \frac{dy}{dx} + y = y^2 \log x \)

15. Solve : \( (1 + x^2) \frac{dy}{dx} + y = \tan^{-1} x \)

16. Solve : \( y'' - 2px + y \, p^2 = 0 \)

Answer any three of the following (3x5=15)

17. Solve : \( (D^3 - 3D + 2)y = 6 e^{3x} + \sin 2x \)

18. Solve : \( 4x^2 \frac{d^2 y}{dx^2} + 4x \frac{dy}{dx} - y = 4x^2 \)

19. Solve : The simultaneous differential Equations

\[
\frac{dx}{dt} + x = y + e^t ; \\
\frac{dy}{dt} + y = x + e^t
\]

20. Solve : \( (3x^2 y^4 + 2xy) \, dx + (2x^2 y^4 - x^2) \, dy = 0 \)

Answer any two of the following (2x5=10)

21. Solve : \( x^2 y'' + xy' - y = 2x^2 \) (\( x > 0 \)) given that \( \frac{1}{x} \) is a part of complementary function and \( y(1) = y'(1) = 0 \).

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22. Solve: by changing the dependent variable \( \frac{d^2 y}{dx^2} - 2 \tan x \frac{dy}{dx} - (a^2 + 1) y = e^x \cos x \) by reducing it to the Normal form.

23. Solve: \( \frac{d^3 y}{dx^3} + \sin x \frac{dy}{dx} - 2y \cos^2 x = 2 \cos^2 x \) by changing the Independent variable.

24. Show that the equation \( x^2 (1 + x) \frac{dy}{dx} + 2x (2 + 3x) \frac{dy}{dx} - 2(1 + 3x) y = 0 \) is exact and hence solve.