DECEMBER 2022 **U/ID 32508/UCM3B**

Time : Three hours Maximum : 75 marks

PART A — ($10 \times 2 = 20$ marks)

Answer any TEN questions

1. Solve $\frac{dy}{dx} + \frac{1}{x} y = 3x$.

2. Solve $x\,y'' - y' = 3x^2$.

3. Solve $x^2\,y'' - 2xy' + 2y = 0$.

4. Write a note on wronskian.

5. If $y = C_1 \sin x + C_2 \cos x$ is the general solution of $y'' + y = 0$ on any uteral then find the particular solution if $y(0) = 2$ and $y'(0) = 3$.

6. Define linear system of homogenous equations.

7. If the auxiliary equation of the system

$$\frac{dx}{dt} = a_2 x + b_2 y$$
$$\frac{dy}{dt} = a_2 x + b_2 y$$

has equal real root 0, then write the general solution of the system.

8. Find the non-trivial solution of

$$\frac{dx}{dt} = 3x - 4y, \frac{dy}{dt} = x - y .$$

9. Form the partial differential equation by elinimate the constances from $z = ax+by+ab$.

10. Form the partial differential equation by eliminate arbitras function from $z = xy + f\left(x^2 + y^2\right)$.

11. Solve : $p^3-q^3 = 0$.

12. Solve : $p^2-q^2 = x - y$.

PART B — ($5 \times 5 = 25$ marks)

Answer any FIVE questions.

13. Solve $(x + y)\, dx - (x - y)\, dy = 0$.

14. Solve $dy/dx + 3y = e^{-x} \cos x$.

15. Show that $y = C_1 \sin x + C_2 \cos x$ is the general solution of $y'' + y = 0$ on any internal, and find the particular solution for which $y(0) = 2$ and $y'(0) = 3$.

16. If the two solutions

$x = x_1(t) \qquad x = x_2(t)$

$y = y_1(t)$ and $y = y_2(t)$

of the homogenous system

$$\frac{dx}{dt} = a,(f)x + b,(t)y; \frac{dy}{dt} = a_2(t)x + b_2(t)y \rightarrow ①$$

have a wranskian $w(t)$ that does not vanish on $[a, b]$ then prove that

$x = C_1 x_1(t) + C_2 x_2(t)$

$y = C_1 y_1(t) + C_2 y_2(t)$

is the general solution of ① on this interval.

17. Find the general integral of the following linear partial differential equation $y^2 p - xy\,q = x(z - 2y)$.

18. Find the complete integral of $p(1 + d) - dz$.

19. Find the complete integral of $p^2 y\ (1+x^2) = \mathrm{d}x^2$.

PART C — (3 × 10 = 30 marks)

Answer any THREE questions

20. Solve: $y'' + n^2 y = 0$.

21. Find the particular solution of $y'' + y = \cos x$.

22. Solve $\frac{dx}{dt} = x + y, \frac{dy}{dt} = 4x - 2y$ .w

23. Find the general integral of
$(x^2 - yz)p + (y^2 - zx)d = z^2 - xy.$

24. Find the complete integral of $p^2 z^2 + d^2 = 1$.

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