Reg. No ....   Name **23U522**

Time : Three Hours   Max. Marks: 75

PART A
Answer any 10 (2 marks each)

1. Find the regular singular point of $x^2(x-2)^2\dfrac{d^2y}{dx^2} + 2(x-2)\dfrac{dy}{dx} + (x+1)y = 0$?

2. Define Bernoulli's equation.

3. Check whether e^x is a solution of $\dfrac{d^3y}{dx^3} - 2\dfrac{d^2y}{dx^2} - \dfrac{y}{x} + 2y$=0

4. If the ratio of the indicial equations r_1 and r_2 are such that $r_1 - r_2 = N$, where N is a positive integer, then write the two linearly independent solutions.

5. Find the general solution of $\dfrac{d^4y}{dx^4} + \dfrac{d^2y}{dx^2} = 0$

6. Form a partial differential equation from the equation $z = (x^2 + a^2)(y^2 + b^2)$ by eliminating arbitrary constants.

7. What is the regular singular point of $2x^2\dfrac{d^2y}{dx^2} - x\dfrac{dy}{dx} + (x-5)y = 0$?

8. What is the unique solution of $\dfrac{d^3y}{dx^3} + 2\dfrac{d^2y}{dx^2} + 4x\dfrac{y}{x} + x^2y$=0 such that f(2) = f ' (2) = f '' (2) =0

9. Define orthogonal trajectory.

10. Form a partial differential equation by eliminating arbitrary constants from $z = ax + by + a^2 + b^2$

11. What is the transformation that is used to solve Bernoulli's equation.

12. What is the auxiliary equation of the Lagrange's linear partial differential equation?

(2 x 10 = 20)

PART B
Answer any 5 (5 marks each)

13. Given that y =x is a solution of $x^2y'' - 4xy' + 4y = 0$. Find a linearly independant solution and write the general solution

14. Find the general solution of the differential equation $x^2\dfrac{\partial z}{\partial x} + y^2\dfrac{\partial z}{\partial y} = (x+y)z$

15. Solve $\dfrac{dx}{y^2 + z^2} = \dfrac{dy}{-xy} = \dfrac{dz}{-xz}$

16. Solve $\dfrac{d^2y}{dx^2} - 3\dfrac{dy}{dx} + 2y = 2x^2 + 4e^{3x}$.

17. Use the operator method to solve the following system of equations
$\dfrac{dx}{dt} + \dfrac{dy}{dt} - 2x - 2y = e^t, \dfrac{dx}{dt} + \dfrac{dy}{dt} - y = e^{4t}$

18. Find the orthogonal trajectories of $y = cx^3$

19. Solve $(3y + 2x + 4)dx - (4x + 6y + 5)dy = 0$.

20. Find the general solution of y^{11}+y = 0 in terms of power series in X.

(5 x 5 = 25)

21.
(a) Find the integral curves of the equation $\dfrac{dx}{x+z} = \dfrac{dy}{y} = \dfrac{dz}{z+y^2}$

(b) Find the general solution of the differential equation $x^2 p + y^2 q = (x+y)z$

22. Solve $\dfrac{dy}{dx} = \dfrac{y+x-2}{y-x-4}.$

23. Solve $\dfrac{d^2y}{dx^2} - 3\dfrac{dy}{dx} + 2y = 2x^2 + e^x + 2xe^x + 4e^{3x}.$

24. Use the method of Frobenius to find the solution of $2x^2\dfrac{d^2y}{dx^2} - x\dfrac{dy}{dx} + (x-5)y = 0$ in some interval $0 < x < R$

(10 x 3 = 30)