

CHANCHAL COLLEGE

ASSIGNMENT - 2021 MATHEMATICS (Honours) **Paper: MTMH - DC- 8**

Full Marks : 32

The figures in the margin indicate full marks. Candidates are required to give their answers in their own words as far as practicable. Notations and symbols have their usual meanings.

Group – A

Answer any four questions 1X4=4

1.
 - (a) Determine the differential equation whose primitive is $\log(xy)=cx$, where c is constant.
 - (b) Define singular solution of a differential equation.
 - (c) Find the particular integral of the equation $\frac{d^2y}{dx^2} + 4y = \cos 2x$.
 - (d) Define regular singular point of an ordinary differential equation.
 - (e) Find PDE by eliminating b and c from $z = bx + \phi(b)y + c$.

Group-B

Answer any two questions 2X5=10

2. If y_1 & y_2 be solutions of the differential equation $\frac{dy}{dx} + Py = Q$, where P & Q are functions of x alone and $y_2 = y_1 z$, then $z = 1 - ae^{-\int y_1 Q dx}$, 'a' being an arbitrary constant.
3. Find the complete integral of the equation by Charpit's method
$$p^2x + q^2y = z, \text{ where } p = \frac{\partial z}{\partial x}, q = \frac{\partial z}{\partial y}.$$
4. Prove that $(2n+1)xP_n = (n+1)p_{n+1} + nP_{n-1}$, $n = 1, 2, 3, \dots$ where P_n is a Legendre's polynomials.
5. Apply the method of variation of parameters to solve :

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

Group-B

Answer any two questions 2X9=18

6. a) Find the value of $J_{\frac{1}{2}}(x)$ [3]

b) Prove that $J_n(-x) = (-1)^n J_n(x)$. [6]

7. Apply Charpit's method to find a complete integral of the partial differential

equation(PDE) $(p^2 + q^2)y = qz$.

8. Solve $(x^2 + 1)\frac{d^2y}{dx^2} + x\frac{dy}{dx} - xy = 0$ in powers of x .

9. Find the eigen values and eigen functions of $\frac{d}{dx}\left(x \cdot \frac{dy}{dx}\right) + y \cdot \frac{\beta}{x} = 0$, $(\beta > 0)$ satisfying the boundary conditions $y(1) = 0$, $y(e^\pi) = 0$.