

SNS COLLEGE OF TECHNOLOGY



(An Autonomous Institution) Coimbatore-641035.

UNIT-II ORDINARY DIFFERENTIAL EQUATIONS Legendre's Linear Differential Equation 2] Solve  $(3x+2)^2 \frac{d^2y}{dx^2} + 3(3x+2)\frac{dy}{dx} - 36y = 3x^2 + 4x + 4x + 3x^2 + 3$ Soln. Gaven [[3x+2)2D2+3(3x+2)D-3674=3x2+4x Take  $3x+2=e^{x} \Rightarrow 3x=e^{x}-2 \Rightarrow x=\frac{e^{x}-2}{2}$ log (3x+2) = 7 (3x+2)D= 3D'  $(37+2)^2 D^2 = 9D'(D'-1)$  $(1) \Rightarrow [9D'(D'-1) + 3(3D') - 36]y = 3[\frac{e^{7}-2}{2}] + 4[\frac{e^{7}-2}{2}] + 1$  $[q_{D}]^{2} - q_{D}' + q_{D}' - 36]y = \frac{3}{7} [e^{2x} + 4 - 4e^{x}] + \frac{4}{3}e^{x} - \frac{8}{3} + 4$  $\left[9D^{2} - 36\right] 9 = \frac{e^{2x}}{3} + \frac{4}{3} - \frac{4e^{7}}{3} + \frac{4}{3}e^{7} - \frac{8}{2} + 1$ = er - 1  $9(D^{R^{2}} - 4)y = \frac{1}{3} [e^{2x} - i]$   $(D^{R^{2}} - 4)y = \frac{1}{27} [e^{2x} - i]$  $CF^2$   $m^2 - 4 = 0 \Rightarrow m^2 = 4$ CF = Aer + Berra  $PT = \frac{1}{h^2 - 1} \left[ \frac{1}{2T} \left( e^{2T} - i \right) \right]$  $= \frac{1}{2T} \left[ \frac{1}{D^2 - 4} e^{2X} - \frac{1}{D^2 - 4} e^{2X} \right]$  $=\frac{1}{27}\left[\frac{1}{7}-\frac{1}{4}e^{27}-\frac{1}{4}e^{27}\right] \xrightarrow{1} p' \rightarrow a$  $=\frac{1}{27}\left[\frac{7}{4}e^{97}+\frac{1}{4}\right]$  $= \frac{1}{108} \left[ \pi e^{87} + 1 \right]$ The solve is y = cf + PT =  $Ae^{87} + Be^{-87} + \frac{1}{108} \left[ \pi e^{7} + 1 \right]$ CS Scanned with CamScaAr(3x+2)<sup>2</sup> + B (3x+2)<sup>2</sup> + \frac{1}{108} \left[ \log \left[ 3x+2 \right] \left[ 3x+2 \right]^{2} + 1 \right]