

SNS COLLEGE OF TECHNOLOGY



(An Autonomous Institution) Coimbatore-641035.

UNIT-II ORDINARY DIFFERENTIAL EQUATIONS Legendre's Linear Differential Equation Legendre 's linear differential Equation An eqn. of the form $\frac{(ax+b)^{n}}{dx^{n}} + a_{1}(ax+b)^{n-1} \frac{d^{n-1}y}{dx^{n-1}} + a^{2}(ax+b)^{n-2} \frac{d^{n-2}y}{dx^{n-2}}$ +.... + $a_{n-1}(ax+b)\frac{dy}{dx}$ + $a_n y = \Theta(x) \rightarrow (i)$ Take ax+B = p2 $z = \log(ax+b)$ (ax+b)D = aD' $(a_{x+b})^{a} D^{a} = a^{a} D' (D'-1)$ $(a_{2}+b_{2}^{3})^{3} = a^{3} D'(D'-1)(D'-2)$ and so on. J. Transform the equation to constant wether sents ogn. (2x+3) y"-(2x+3)y'+ 2y = 6x Soln. Given [@x+3]2 p2- (2x+3) D+2]y= 6x Take $ax+3 = e^{z} \Rightarrow ax = e^{z}-3$ $z = log(ax+3) \qquad b = e^{z}-3$ (2x+3)D = 2D' $(22+3)^2 D^2 = 4 D' (D'-1)$ $(1) \Rightarrow [4D'(D'-1) - 2D' + 2] y = 6 \left[\frac{e^{2} - 3}{2}\right]$ $[4D'^{2} + D' - 2D' + 2] y = 3[e^{2} - 3]$ $[4D'^{2} 6D' + 2]y = 3e^{2} - 9$ which is a linear egn with constant coeffectents. 2]. Solve $(x+2)^2 \frac{d^2y}{dx^2} - (x+2)\frac{dy}{dx} + y = 3x + 4$ Scanned wit CamScanner



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UNIT-II ORDINARY DIFFERENTIAL EQUATIONS Legendre's Linear Differential Equation Sola Given $\int (2(+2)^2 D^2 - (2(+2) D + 1] y = 32(+4 - -2(1))$ Take $x+2=e^{\chi} \Rightarrow \chi=e^{\chi}-2$ x = log (x+2) (2+2)D = D' $(2+2)^2 D^2 = D' (D'-1)$ $(1) \Rightarrow \left[D'(D'-1) - D' + j \right] = 3 \left[e^{z} - z \right] + 4$ $\begin{bmatrix} D'(D'-1) - D + y - y \\ D' - D' + y \end{bmatrix} = 3e^{7} - 6 + 4$ CE $m^2 - am + r = 0$ 1 . 1 . J (m-1) (m-1) = 0m=1,1 $PT_{2} = \frac{1}{p^{2} - 2p' + 1} = \frac{3e^{2} + \frac{1}{p^{2} - 2p' + 1}} = \frac{1}{p^{2} - 2p' + 1} = \frac{1}{p^{2} - 2p' + 1}$ $CF = (A + BZ) P^{Z}$ $= \frac{1}{1-2+1} = \frac{1}{1-2+1} = \frac{3e^{2}}{2} = 2 + \frac{1}{1} = \frac{1}{2} = \frac{1}{$ $= \chi \frac{1}{2d-2} = 3e^{\chi} - 2$ $= \chi \frac{1}{2(1)-2} = 3e^{\chi} - 2$ = z2 - 3ez - 2 $PT = \frac{37^2 e^7}{9} = 2$ The Sol<u>n</u> 95, y = CF + PI -=(A+Bx)er + 3x er - 2 Scanned with= $[A + B \log (x+2)](x+2) + \frac{3[\log (x+2)]^2(x+2)}{2}$ CamScanner