

SNS COLLEGE OF TECHNOLOGY (An Autonomous Institution)

Coimbatore-641035.



UNIT-II ORDINARY DIFFERENTIAL EQUATIONS

Homogeneous Linear ODE with constant coefficients

JAN - I

Differential Equation.

An apr. Phyolving differential coefficients 024 descivations is called differential apr.

addrawy deflerential eqn.

A defected on which depends on

only one Andependent voulable is called ordenary differential eqn.

Order and degree :

* The order of the highest descrative occurring in the given ogn is called the order of a differential ogn.

to the degree of the bighest description of a Fin the gran. By called the degree of a differential eqn.

Second order Process ODE with constant wefficients: The general 19noar ODE with constant wefficients is of the form

 $a_{0} \frac{d^{h} y}{dx^{n}} + a_{1} \frac{d^{h-1} y}{dx^{h-1}} + a_{2} \frac{d^{h-2} y}{dx^{h-2}} + \dots + a_{n} y = f(x)$ where $a_{0}, a_{1}, \dots a_{n}$ are constants and $f(x) \geq a \quad y = 0 \quad a_{1} \times \dots \quad a_{n} \times x$ when $f(x) = 0 \quad q_{n}$ (1) $\leq called$ homogeneous one \leq

If for to an (1) is called hon-homogeneous ODE.



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UNIT-II ORDINARY DIFFERENTIAL EQUATIONS Homogeneous Linear ODE with constant coefficients This apr. can be wratten as, $\left[a_{0} D^{n} + a_{1} D^{n-1} + a_{2} D^{n-2} + \dots + a_{n}\right) y = f(B_{1})$ where $D = \frac{d}{dx}$ Soluteon = CF+ PI = complementary function + Particular "integ TO find EF: Roots CF 1). ROOTS are real & deficient Aemix + Bemax mit ma i 'n). Roots are real & Same (A+ Bx) ema $m_1 = m_2 = m$ Roots are maginary. (a complex) en [A cos px + B Sin p: in). m=a±iB To fend pI: $PI = \frac{1}{f(D)} \frac{f(x)}{f(x)}$ RHS = 0J. Solve $(D^{2} - 5D + 6) = 0$ Soln. The auxiliary equ. se $(m^2 - 5m + 6 = 0)$ (m-3)(m-2)=0m = 2, 3.". The MOOLE are shear and althornent.



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CF = Ae AX + Be AX . y= cf = Ae^{2x}+Be^{3x} $\overrightarrow{x}]. \quad \operatorname{solve} \quad \frac{d^2 y}{dx^2} - 6 \frac{dy}{dx} + 9y = 0$ soin. $(\vec{D} - 6D + q)y = 0$ The Auxelouy egn 30 $m^{2}-6m+9=0$ $(m-3)^2 = 0$ m = 3, 3The loots are real and same. $CF = (A + Bx)e^{3x}$ ·· y=cF= (A+Bx) e3x 3]. solve (p?+1) = 0 (m+1) = 0 Soln. The Auralogy eqn. B Takeng square root on both sodas m2++= 0 $m^2 = -1$ $m = \pm 1$ The looks are the will graggeracy Here $\alpha = 0$, $\beta = 1$ ·· CF = e (Acos x + B SPAZ) = A COSX + B SPA 7 · y= CF= A LOS X + BSPAX 4]. Solve (04-174 = 0 The aurology eqn. is mit-) = 0 Soln.



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$$(m^{2})^{2} - 1^{2} = 0$$

$$(m^{2}+1) (m^{2}-1) = 0$$

$$m^{2}+1 = 0$$

$$m^{2}+1 = 0$$

$$m^{2}-1 = 0$$

$$m^{2}=1$$

$$m^{2}=1$$

$$m^{2}=1$$

$$m^{2}=1$$

$$m^{2}=1$$

 $\therefore cf = Ae^{a} + Be^{-x} + c\cos x + DSin x.$