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## SNS COLLEGE OF TECHNOLOGY

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Unit-Y Laplace Thansforms mountain situants Give inter a carlos [a, a] Laplace transformation, named after a great Introduction :.. French Mathematician Pierre Simon De Laplace (1749-1827) who used such transformation in the "Theory of Robability" Uses of Laplace Inanstallion. 1. It is used to find the Solution of linear differential equations Uses of Laplace Thansformation: 2. It helps in solving the differential equation with boundary Values without finding the general solution and then finding the Values of the arbitrary constants. Thansformation is an operation which converts a mathematical expression to a different but equivalent form. Laplace Transformation: Definition Let f(t) be a function of t defined for too then the laplace transform of f(t), denoted by LSF(t) or f(s) is defined  $L\left[f(t)\right] = \int_{0}^{\infty} \int e^{-st} f(t) dt^{\frac{1}{2}} = F(s) = \int_{0}^{\infty} (i) \int_{0}^{1} e^{-st} f(t) dt^{\frac{1}{2}} = F(s) = \int_{0}^{1} (i) \int_{0}^{1} e^{-st} dt^{\frac{1}{2}} = F(s) = \int_{0}^{1} e^{-st} f(t) dt^{\frac{1}{2}} = \int_{0}^{1}$ by, Rovided the integral exists.



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Conditions for existence of Laplace transform: i) f(t) should be continuous or Piecewise continuous in the given close interval [a,b] where a 70. ii) f(t) should be of exponential order. Esponential Order: A function f(t) is said to be of exponential order if  $\begin{array}{ll} |t & -st \\ t \rightarrow \infty \end{array}$ Ezample: Example: i)  $t^2$  is of exponential order. It  $e^{st} f(t) = It e^{-st} t^2$   $t \to \infty$   $= It \frac{t^2}{e^{tst}}$  ( $\frac{\infty}{\infty}$  indeferminant form)  $= \frac{1t}{t + \vartheta} \frac{2t}{s^2 e^{st}}$  Apply L'Hospital rule  $= \frac{1t}{s^2 e^{st}} \frac{2}{s^2 e^{st}}$ ii) et is not of exponential order. It  $e^{-st}f(t) = |t| e^{-st}e^{t^2}$   $t \to \infty$   $t \to \infty$ 

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0 e r D  $e^{t^2}$ is not of exponential order.