

(AnAutonomousInstitution)

Coimbatore-641035.



UNIT 5- Laplace Transform

Definitions, properties, existence conditions

UNIT-V LAPLACE TRANSFORMS I mansferm : Candibions] TNTRODUCTION : (1) f(t) Should be continuous or or a produe Laplace Transformation signamed after a great French Mathematician Pierre Simon De Laplace (1749-1827) who used such transformations in the " Theory of probability". Said to be function -feed is Uses of Laplace Transformation: bider if. 1. It is used to find the solution of linear differential equations - ordinary as well as partial. a. It helps in solving the differential equation with boundary values without finding the general solution and then finding the values of the arbitrary constants Transformation : No. 5----A transformation is an operation which converts a mathematical expression to a different but equivalent form. 2t = 1t Laplace Transformation : Definition : SIL & Let f(t) be a function of t defined for tro Then the Laplace transform of f(t), denoted by 1 { f(t) } or F(s) is defined by, $\sum \left[f(t)\right]^{\frac{1}{2}} \int e^{-st} f(t) dt^{\frac{1}{2}} = F(s)$ Provided the integral exists. 00 (---) - 00 -=





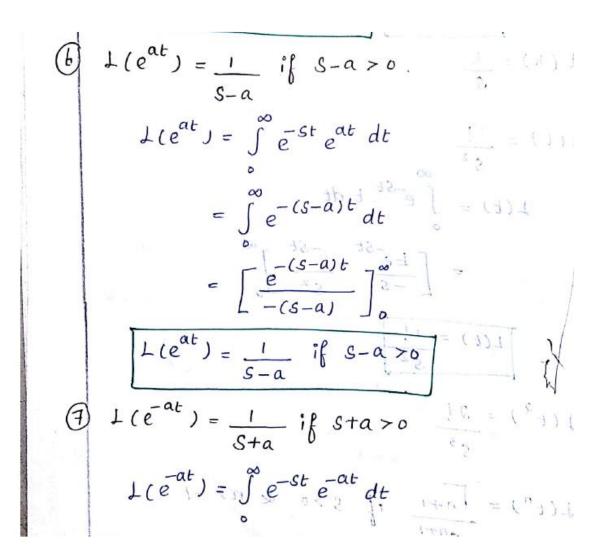
Conditions for existence of Laplace transform: (i) f(t) should be continuous or piecewise Continuous in the given closed interval [a,b] where a>0 (ii) f(t) should be of exponential order. Exponential order: A function f(t) is said to be of exponential order if, $e^{isomit} = \frac{1}{2} + \frac$

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Transforms of elementary functions ("1))

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= J.e-(sta)t dt : (Jo des) 1 - boil - at (a) $L(e^{at}) = \frac{1}{S+a} \quad if \quad s+a > [o - f] = (Jo + 2a) + 1$ To find L(wsat) & L(sinat):(8) We know ein = coso + isino. $L(e^{iat}) = \frac{1}{S - ia} \frac{2S}{S} \frac{1}{S} =$ $\int \frac{1}{S - ia} \frac{S + ia}{S - ia} \frac{1}{S} =$ $\int \frac{1}{S - ia} \frac{S + ia}{S + ia} \frac{1}{S} = (1 \text{ m} \text{ m$ $L(\cos at + i \sin at) = \frac{S}{S^{2} + a^{2}} + \frac{i}{S^{2} + a^{2}}$ (1) Equating Real & imaginary pasts, $\begin{bmatrix}
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 I (\sin at) &= \frac{a}{-S^2 + a^2}
 \end{bmatrix}
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 18 &=$ To find L(sinhat): - [(1+3)] L (9) $L \left[\sinh at \right] = L \left(\frac{e}{16} \frac{e}{2} \right)$ $\frac{1}{2} + \frac{1}{2} + \frac{1}$





