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DEPARTMENTOFMATHEMATICS

UNIT-V LAPLACETRANSFORM

PERIODIC FUNCTIONS : A junct fit) is said to be periodie if f (E+T) = f(E) for all values of t and for certain values of T. The smallest value of T for which 7 (t+T)= Z(t) for all t is called the period of the func. gO! The funct. Shith cost are periodic functions both having period 271. sint = sin(t+2i) = sin(t+4i) = ...consider the func. fit)= St if oxtx2 and fit+47=fit; IT of periodic functions: Letper) be a periodic function with period T. Then LIZ(E)J= 1-e-ST STe-st git) dt.





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() Find LT of Z(E) = (21), 05153& Z(E+3)=Z(E) Soln: f(E) & a portable func. with period 3. (c) T=3 $Wri L [g(t)] = \frac{1}{1-e^{-st}} \int_{2}^{T} e^{-st} g(t) dt$ $= \frac{1}{1 - e^{-3S}} \int_{e^{-St}}^{3} \left(\frac{2t}{3}\right) dt = \frac{1}{1 - e^{-3S}} \left(\frac{2}{3}\right) \int_{e^{-St}}^{St} dt$ $= \frac{1}{1-e^{-3s} \left(\frac{2}{3}\right) \left[\frac{be^{-st}}{-s} - \frac{e^{-st}}{s^2}\right]^3}$ $= \frac{1}{1 - e^{-3S}} \left(\frac{2}{3}\right) \left[\frac{3e^{-3S}}{-S} - \frac{e^{-3S}}{S^2} + \frac{1}{S^2}\right]$ $= \frac{1}{1 - e^{-3S}} \left(\frac{2}{3}\right) \left[\frac{1 - e^{-3S}}{5^2} - \frac{3e^{-3S}}{5^2}\right]$ (2) Find the LT of fit & fit) = et oxt < 2TT and fit)=f(t+2TT Solni Z(E) % a periodie function with period 211 (1) T=211 $L[f(t)] = \frac{1}{1-e^{-z_{IIS}}} \int_{e^{-st}}^{2\pi} e^{-st} e^{t} dt$ $= \frac{1}{1 - e^{-2\pi i s}} \int_{0}^{2\pi} e^{(1-s)t} dt = \frac{1}{1 - e^{-2\pi i s}} \frac{e^{(1-s)t}}{(1-s)} \int_{0}^{2\pi i s} \frac{e^{(1-s)t}}{(1-s)} dt = \frac{1}{1 - e^{-2\pi i s}} \frac{e^{(1-s)t}}{(1-s)} \frac{e^{(1-s)t}}{(1-s$ $= e^{2\pi(1-s)}$ $\overline{(1-s)(1-e^{-2\pi s})}$

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3) Find LT of f(t)= ft, oct<1 such that {(t+2)=f(t) Som: f(t) is a periodic func with period 2 tis T=2. $L [f(t)] = \frac{1}{1 - e^{-2s}} \int e^{-st} f(t) dt$ $= \frac{1}{1-e^{-2s}} \int e^{-st} t \, dt + \int e^{-st} (2-t) \, dt$ $= \frac{1}{1 - e^{-2S}} \int_{-S}^{2} \frac{e^{-S}}{s^2} + \frac{1}{s^2} + \frac{e^{-2S}}{s^2} + \frac{e^{-S}}{s^2} + \frac{e^{-S}}{s$ $= \frac{1}{1 - e^{-2S}} \int \frac{1 - e^{-S}}{S^2} - \frac{e^{-S}}{S} + \frac{e^{-2S}}{e^2} + \frac{e^{-S}}{S} \int \frac{1}{S} \frac{e^{-S}}{S} \int \frac{1}{S} \frac{1 - e^{-S}}{S} + \frac{1 - e^{-S}}{S} +$ = 1 1-e-25 \$ 1/52 [e-28 -2e-3+1]} $1 = \frac{(1-e^{-s})^2}{s^2(1-e^{-s})} \xrightarrow{(1-e^{-s})^2}_{s \in [1-(e^{-s})^2]} \xrightarrow{(1-e^{-s})^2}_{s \in (1-(e^{-s})^2]}$) find it of the periodic func. f(t) = {1, 0×t×a & $= \frac{1}{4}(t+2a) = \frac{1}{4}(t)$. $\frac{1}{5} \frac{(1-e^{-5a})^2}{5(1-e^{-2as})}$ ELLET Constant (n



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