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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 mallest value of T for which 7 (t+T)= Z(t) for all t is called the period of the func. gO! The Junct. State cost are periodic functions both having period 271. $sht = sh(t + 2\pi) = sh(t + 4\pi) = ...$ consider the func. fit)= St y 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 F(E) = (21), 05153& f(E+3)=, f(E) Soln: f(E) & a portable func. with period 3. (i) T=3 WITT $L \Gamma_{q}(t) = \frac{1}{1-e^{-st}} \int e^{-st} q(t) dt$ $= \frac{1}{1 - e^{-3S}} \int_{e^{-St}}^{3} \left(\frac{2t}{3}\right) dt = \frac{1}{1 - e^{-3S}} \left(\frac{2}{3}\right) \int_{e^{-St}}^{St} dt$ $= \frac{1}{1-e^{-3s} \left(\frac{2}{3}\right) \left[\frac{1}{1-s} - \frac{1}{s} - \frac{1}{s} - \frac{1}{s}\right]^3}$ $= \frac{1}{1 - e^{-3S}} \left(\frac{2}{3}\right) \left[\frac{3e^{-3S}}{-S} - \frac{e^{-3S}}{S^2} + \frac{1}{S^2}\right]$ $= \frac{1}{1 - e^{-3S}} \left(\frac{2}{3}\right) \left[\frac{1 - e^{-3S}}{5^2} - \frac{3e^{-3S}}{5^2}\right]$ (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 $L[f(t)] = \frac{1}{1-e^{-2\pi s}} \int_{e^{-st}}^{2\pi s} e^{-st} dt$ $= \frac{1}{1 - e^{-2\pi i s}} \int_{0}^{2\pi} e^{(1-s)t} dt = \frac{1}{1 - e^{-2\pi i s}} \frac{e^{(1-s)t}}{(1-s)} \int_{0}^{2\pi i s}$ $= e^{2\pi (1-s)}$ $\overline{(1-s)(1-e^{-2\pi s})}$

23MAT103-DIFFERENTIAL EQUATIONS AND TRANSFORMS

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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. $L[f(t)] = \frac{1}{1 - e^{-2s}} \int e^{-st} f(t) dt$ = $\frac{1}{1-e^{-2s}}\int e^{-st}t dt + \int e^{-st}(z-t) dt$ $= \frac{1}{1 - e^{-2S}} \int_{-S}^{2} \frac{e^{-S}}{s^2} + \frac{1}{s^2} + \frac{e^{-2S}}{s^2} + \frac{e^{-S}}{s^2} - \frac{e^{-S}}{s^2} \Big\}^{\frac{1}{2}}$ $= \frac{1}{1 - e^{-2S}} \int \frac{1 - e^{-S}}{S^2} - \frac{e^{-S}}{S} + \frac{e^{-2S}}{e^2} + \frac{e^{-S}}{S} \int \frac{1}{S} \frac{e^{-S}}{S} \frac{1}{S} \frac{1 - e^{-S}}{S} \frac{1 -$ = 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 & \$ (t+2a) = Z(t). $\frac{1}{1-e^{-Sq}}$ TULFI @ 1. [COM] 1 (0

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