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EE224 MODULE EXAM

Q1) Using trigonometric series expansion, find the Fourier series of function

$$f(t)=\begin{cases}0 & \text{if } -2<t<-1\\ k & \text{if } -1<t<1\\ 0 & \text{if } 1<t12\end{cases}$$

Q2) A sinusoidal voltage Esinωt is passed thorough a half wave rectifier that clips the negative portion of the wave. Find the Fourier series of the resulting periodic function

$$u(t)=\begin{cases}0 & \text{if } -T<t<0\\ E\sin\omega t & \text{if } 0<t<T\end{cases}$$ where period=2T=2π/ω, T=π/ω

Q3) Find the Fourier transform of the below function. Skecth the magnitude and phase of the Fourier transform presentation.

$$h(t)=\begin{cases}\beta e^{-\alpha t} & t>0\\ 0 & t<0\end{cases}$$

Q4) Find the inverse Fourier transform of

$$F(\omega)=\frac{k(1-e^{-ia\omega})}{i\omega}$$

Bonus questions:

B1) Calculate the following integral of the waveform $h(t)=\begin{cases}e^{-at} & t>0\\ 0 & t<0\end{cases}$.

$$z(t)=\int_{-\infty}^{\infty}h(\tau)h(t+\tau)d\tau$$ It represents an autocorrelation function of a signal.

B2) Proof the following theorem.

$$f(t)*h(t)=\int_{-\infty}^{\infty}f(\tau)h(t-\tau)d\tau=\int_{-\infty}^{\infty}f(t-\tau)h(\tau)d\tau$$