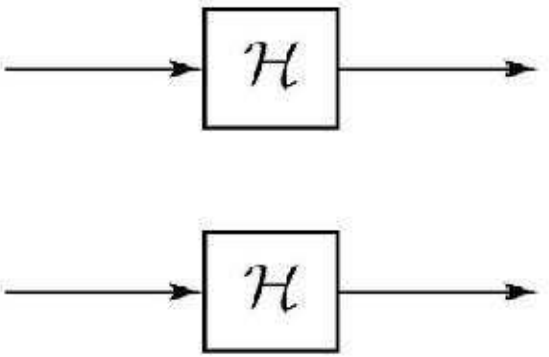
ENSC380
Lecture 14

Objectives:

- Find the output of LTI systems when the input (excitation) is a periodic signal

LTI Systems

- Recall that for LTI systems, if the excitation is a complex exponential, $e^{j2\pi ft}$ or $e^{j2\pi fn}$, the output is:



- Also, LTI systems are described by linear constant-coefficient differential (or difference) equations, e,g,

$$ay'(t) + y(t) = x(t)$$

- Replace $y(t)$ and $x(t)$ in the equation with the complex exponential, to find A:

Periodic input

- Now consider the input to be a periodic signal $x(t)$ and use CTFS with fundamental frequency f_0 to represent it:

- For each component of $x(t)$, $X[k]e^{j2\pi(kf_0)t}$ the output is:

- Thus, the complete output is:

Example

For the RC low pass filter below, find the output when the input signal is $v_{in}(t) = \cos(6\pi t)$