<!--EECS 120, MT 1, Fall 2000-->

Problem #1 (16 points)

Classify the following systems. In each column, write "yes", "no" or "?" (Use "?" if the system can not be classified with the given information). The input ot the system is *x(t)* and the output is *y(t)*. (+1 for correct answer, 0 for black, -1 for incorrect; 0 minimum score.)

System	Causal	Linear	Time Invariant	BIBO Stable
a. *y(t) = |x(t)|*				
b. *yt(t) = x(t) + 1*				
c. *y(t) = dx(t)/dt*				
d. *y(t) = int(x(L)x(t-L),dL,-infinity,+infinity)*				

Problem #2 (24 points)

Consider a system whose behavior is specified by the differential equation:

dy(t)/dt + y(t) = x(t)

with input *x(t)* and output *y(t)*.

If *x(t)* = cos*(t)*, find *y(t)*. Express *y(t)* as a real function.

Problem #3 (36 points)

Answer each part independently, using the sketches on the next page, or state NONE.
The sketches on the next page can be used as either spectra or time plots.
The vertical scale, horizontal scale, and origin in each of the answer sketches are arbitrary, and independent.

Hint: sin(*pi*t*)/(*pi*t*) <-> *pi*(w/(2*pi)*)

a) *y(t)* = sin(*pi*t*)/(*pi*t*) * sum(*delta(t-n)*), *y(t)* is sketch:

b) *y(t)* = sin(*3*pi*t*)/(*pi*t*) * sum(*delta(t-n)*), *y(t)* is sketch:

c) *y(t)* = sin(*pi*t*)/(*pi*t*) * sum(*delta(t-n)*), *Y(w)* is sketch:

d) *y(t)* = sin(*pi*t*)/(*pi*t*) * sum(*delta(t-n/2)*), *Y(w)* is sketch:

e) *y(t)* = [cos(*pi*t*) * cos(*3*pi*t*)] * sin(*3*pi*t*)/(*pi*t*), *y(t)* is sketch:

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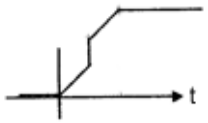


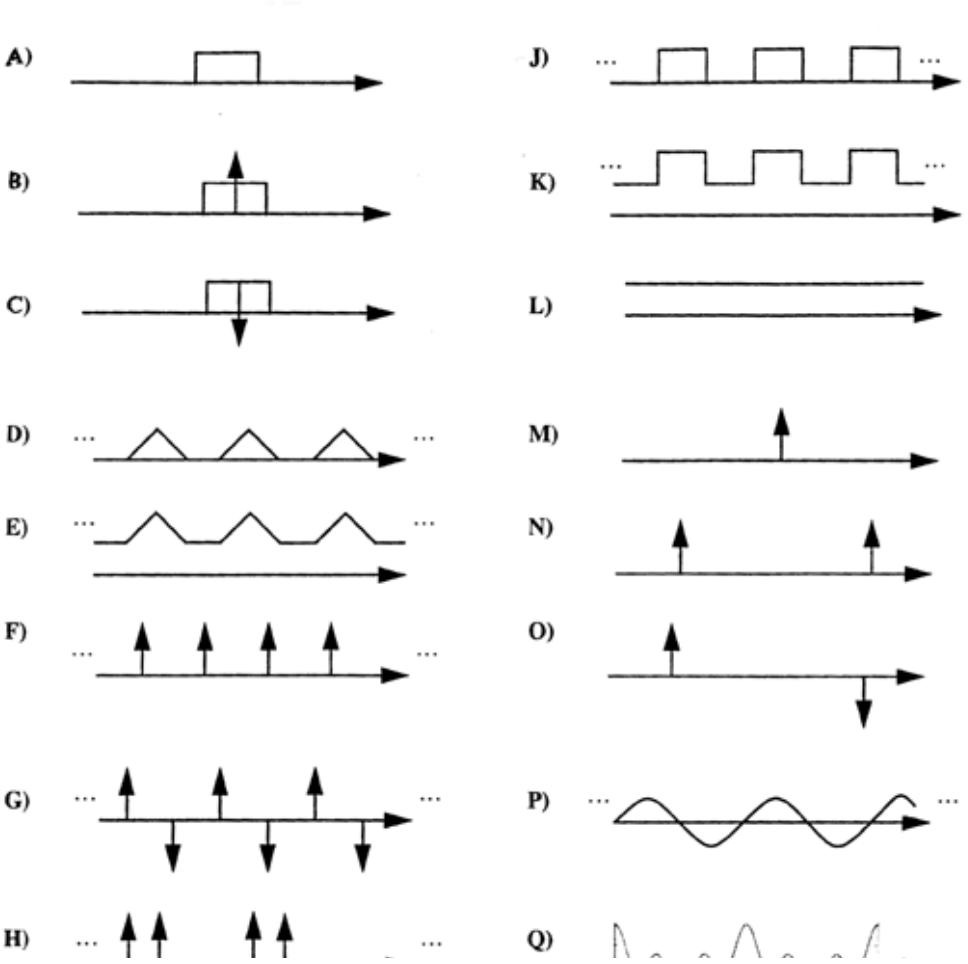
f) An LTI system has impulse response *h(t)i*. The step response *h(t)*u(t)* =

The impulse response *h(t)* is: __

The sketches on this page can be used as either spectra or time plots.

The vertical scale, horizontal scale, and origin in each of the answer sketches are arbitrary, and should be considered independent.

D-K are periodic, and P and Q are periodic



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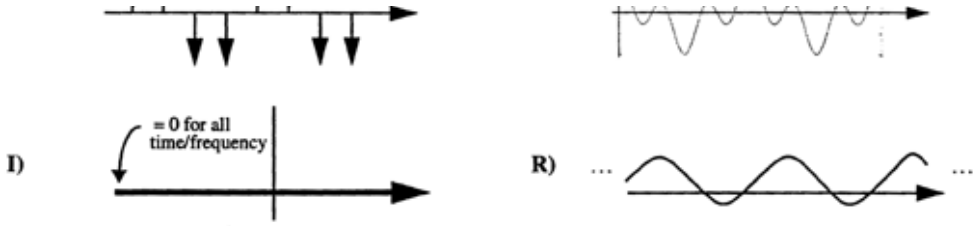
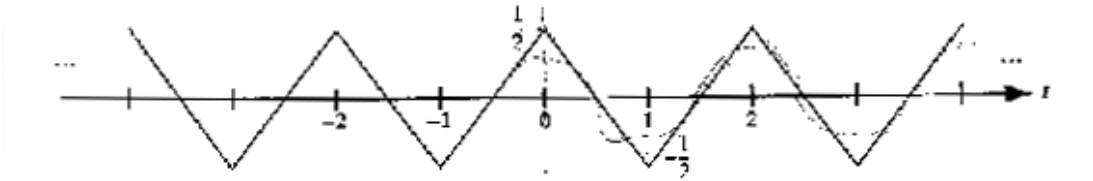


Problem #4 (24 points)

x(t) is a periodic function, as shown:



x(t) can be represented as a Fourier Series *x(t)* = sum(*Ak*e^(j*k*Wo*t)*), where *Wo* = 2*pi/2= pi, and -infinity < *k* < infinity

[15 pts] a) Find *Ak*, (Hint: pi(t) <-Fourier Transform-> 2*sin(W/2)/W)

[3 pts] b) What is the time average power at the fundamental frequency?

[3 pts] c) What is the time average DC power in *x(t)*?

[3 pts] d) What is the time average power in *x(t)*?
