Use 0.7 mm mechanical pencil. Keep 0.25 inch from edge of box. Erase mistakes thoroughly.

HWQ1
Problem Type Acronym

Name

ID #

Question

all of the following are true about convolution in the time domain for a linear time-invariant system, except...

(A) it is equivalent to multiplication in the frequency domain
(B) the input convolved with the impulse response yields the output
(C) it can operate only in the continous domain, but not the discrete domain.

Answer

(C) is not true.

Use 0.7 mm mechanical pencil. Keep 0.25 inch from edge of box. Erase mistakes thoroughly.

HWQ2 — Problem Type Acronym | Name | ID #

Question

THE NYQUIST CRITERION STATES THAT

(A) CONVOLUTION IN THE TIME DOMAIN MEANS MULTIPLICATION IN THE FREQUENCY DOMAIN

(B) FREQUENCIES ABOVE HALF THE SAMPLING FREQUENCY WILL EXHIBIT ALIASING

(C) LINEAR SYSTEMS CAN ONLY CHANGE THE PHASE AND MAGNITUDE OF A SINUSOID.

Answer

(B)

Use 0.7 mm mechanical pencil. Keep 0.25 inch from edge of box. Erase mistakes thoroughly.

HWQ 3
Problem Type Acronym

Name

ID #

Question

Given $x[n] \overset{F}{\leftrightarrow} X(\omega)$

Explain why $X(\omega)$ is periodic in terms of the individual phasors that make up $x[n]$, namely $X(\omega)e^{j\omega n}$

Answer

As one steps from n to $n+1$ each phasor appears to step from $e^{j\omega n}$ to $e^{j\omega(n+1)}$ but could just as well be stepping to $e^{j[\omega+k2\pi](n+1)}$

Use 0.7 mm mechanical pencil. Keep 0.25 inch from edge of box. Erase mistakes thoroughly.

HWQ 4
Problem Type Acronym

Name

ID #

Question

Given a periodic signal $x(t) \overset{Fs}{\longleftrightarrow} a_k$ passing through an LTI system, which can change in the output signal?

(A) the average power.
(B) the fundamental frequency ω_0.
(C) the DC value.
(D) the fact that the signal is periodic.
(E) the phase of a given harmonic.
(F) the amplitude of a given harmonic

Answer

(A) (C) (E) (F)

Use 0.7 mm mechanical pencil. Keep 0.25 inch from edge of box. Erase mistakes thoroughly.

HWQ5 (Problem Type Acronym) | Name | ID #

Question

Which of the following is/are true?

(A) Fourier Series components can never affect each other when passing through an LTI system

(B) If Fourier Series coefficient a_k is the complex conjugate of a_{-k}, then $x(t)$ is real.

(C) The Fourier Series for a given $x(t)$ is not always unique.

(D) If $a_0 = 0$ the average value of $x(t)$ is always zero

(E) Non-periodic signals can have a Fourier Series.

Answer

(A) (B) (D)

Use 0.7 mm mechanical pencil. Keep 0.25 inch from edge of box. Erase mistakes thoroughly.

HWQ6
Problem Type Acronym

Name

ID #

Question

The fourier Transform $X(\omega)$ of a signal $x(t)$ contains what 2 parameters of the component sinusoid at ω? This means that the _____ of a sinusoid is never changed by an LTI system. For real $x(t)$ what relationship exists between $X(\omega)$ and $X(-\omega)$ and what does this mean about the two phasors at ω and $-\omega$?

Answer

magnitude and phase.

Frequency

$X(\omega) = X(-\omega)^*$

They spin in opposite directions, always mirror images across the real axis.

Use 0.7 mm mechanical pencil. Keep 0.25 inch from edge of box. Erase mistakes thoroughly.

HWQ7
Problem Type Acronym

Name

ID #

Question

What type of signals can be analyzed by Laplace Transforms but not by Fourier Transforms? Describe how the Laplace Transform achieves this, and what role is played by the real part of s. Why can the differential equation of a system be represented by

$$H(s) = \frac{N(s)}{D(s)}$$ ← numerator } polynomials
← denominator }

Answer

Signals that grow to infinity, in other words, the impulse response of an unstable system.
Laplace is basically Fourier of the signal times a real exponential, where σ is the coefficient of the exponent. This constains the signal to keep it finite, given a proper σ. Since taking a derivative is multiplying by s, Diff. Eqs become polynomials, with x(t) terms in N(s) and Y(t) in D(s)

Use 0.7 mm mechanical pencil. Keep 0.25 inch from edge of box. Erase mistakes thoroughly.

HWQ8 | Problem Type Acronym | Name | ID #

Question

The input to a LTI system is

$$x(t) = \cos(3t) - \sin(3t) + \cos(9t)$$

(A) what is the fundamental freq. ω_0?

(B) what is the fundamental period T_0?

Which of the following are possible outputs?

(C) $y(t) = 6 + \cos(9t)$

(D) $y(t) = \cos(3t) + 2\cos(9t)$

(E) $y(t) = 3\cos(3t - 1)$

(F) $y(t) = 2\sin^2(3t)$

Answer

(A) $\omega_0 = 3$

(B) $T_0 = \frac{2\pi}{3}$

(D) and (E) are possible

(C) and (F) are not.

Use 0.7 mm mechanical pencil. Keep 0.25 inch from edge of box. Erase mistakes thoroughly.

HW Q9

Problem Type Acronym | Name | ID #

Question

All natural systems (True or False)

T F yield measurements on the real axis.

T F are inherintly linear.

T F are inherintly time-invariant.

T F have an impulse response $h(t)$ for which $h(t)=0$, $t<0$.

T F have memory (assuming non-zero impulse response)

Answer

T

F

F

T

T

Use 0.7 mm mechanical pencil. Keep 0.25 inch from edge of box. Erase mistakes thoroughly.

HWQ10 | Problem Type Acronym | Name | ID #

Question

Regarding the Fourier Transform $X(\omega)$

(A) Convolution in the time domain equals _____ in the frequency domain.

(B) At a given frequency, $X(\omega)$ represents the following two properties of the underlying sinusoids: ____ and ____.

(C) Linear systems never change the following property of a sinusoid: _____.

(D) Periodic functions in time produce _____ in the frequency domain.

(E) Real functions in time lead to ____ ____ in the frequency domain.

Answer

(A) multiplication.

(B) amplitude, phase

(C) Frequency.

(D) Impulses

(E) Complex Conjugates