Assignment 05

The due date for submitting this assignment has passed. Due on 2017-09-01, 23:59 IST. 
As per our records you have not submitted this assignment.

Note: For multiple-choice questions, square boxes for choices imply that one or more choices could be correct. You will get full marks only when all the correct answers are chosen. Radio buttons (circles) for choices imply that only one choice is correct. Note that the text for each choice appears either on the right or below the corresponding button. For the short-answer questions, you need to enter the answer in a text box. Please take care to enter the answer without spaces because the server simply checks for exact text match. Please ask questions on the forum if the required format for answers is confusing.

All the best.

Note: $T_0$ refers to the fundamental period of a periodic signal and $\omega_0, f_0$ are the corresponding fundamental frequencies in radians/seconds and Hz respectively, where $\omega_0 = 2\pi f_0$.

$Ev\{x(t)\}$ denotes the even part of the signal $x(t)$. $Re\{x(t)\}$ denotes the real part of $x(t)$. $Im\{x(t)\}$ denotes the imaginary part of $x(t)$. Similar notation applies to $a_k$.

Unless otherwise stated, all voltages are in volts and currents in amperes.

1) Let $f(t) = e^{-8t}u(t)$. What is the value of $\frac{1}{|F(j\omega)|}$ at $\omega = 15$ rad/sec?

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: String) 17

2) For the function $f(t) = e^{-8t}u(t)$, what is the phase response $\phi(j\omega)$?

$\phi(j\omega) = -\tan^{-1}(\omega/8)$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\phi(j\omega) = -\tan^{-1}(\omega/8)$
3) Consider the function \( x(t) \) as shown in the figure given below.

![Graph of x(t)](image_url)

\[
X(j\omega) = 10 \text{sinc}\left(\frac{5\omega}{\pi}\right)
\]

\[
X(j\omega) = 5 \text{sinc}\left(\frac{10\omega}{\pi}\right)
\]

\[
X(j\omega) = 2.5 \text{sinc}\left(\frac{\omega}{\pi}\right)
\]

\[
X(j\omega) = 10 \text{sinc}\left(\frac{2.5\omega}{\pi}\right)
\]

No, the answer is incorrect.
Score: 0
Accepted Answers:
\[
X(j\omega) = 10 \text{sinc}\left(\frac{2.5\omega}{\pi}\right)
\]

4) Let \( x(t) \) be the waveform shown in question 3 above. Choose the correct responses from the choices given below.

- phase response \( \phi(j\omega) = \pi, \omega = \pi/2 \)
- phase response \( \phi(j\omega) = 0, \omega = \pi/2 \)
- phase response \( \phi(j\omega) = \pi, \omega = \pi \)
- phase response \( \phi(j\omega) = 0, \omega = \pi \)

No, the answer is incorrect.
Score: 0
Accepted Answers:
\[
\text{phase response } \phi(j\omega) = \pi, \omega = \pi/2
\]
\[
\text{phase response } \phi(j\omega) = 0, \omega = \pi
\]

5) Let \( x(t) \) be a real valued periodic signal with exponential Fourier series coefficients \( c_k \). What is the relationship between the fourier series coefficients of \( E\{x(t)\} \) and \( c_k \)?

- \( j \text{Im}\{c_k\} \)
- \( j \text{Re}\{c_k\} \)
- \( \text{Im}\{c_k\} \)
- \( \text{Re}\{c_k\} \)

No, the answer is incorrect.
Score: 0
Accepted Answers:
\[
\text{Re}\{c_k\}
\]
Let \( x(t) \) and \( y(t) \) be two periodic signals with the same period \( T \). Let \( c_k \) and \( d_k \) be the fourier series coefficients of \( x(t) \) and \( y(t) \) respectively. Express the fourier series coefficients of the product signal \( x(t)y(t) \) in terms of \( c_k \) and \( d_k \).

\[
\begin{align*}
&c_k d_k \\
&\sum_{l=-\infty}^{\infty} c_l d_{l-k} \\
&\sum_{l=-\infty}^{\infty} c_l d_{k-l} \\
&\sum_{l=-\infty}^{\infty} d_l c_{k-l}
\end{align*}
\]

No, the answer is incorrect.

Score: 0

Accepted Answers:
\[
\sum_{l=-\infty}^{\infty} c_l d_{k-l} \\
\sum_{l=-\infty}^{\infty} d_l c_{k-l}
\]

7) For the periodic square wave signal shown in figure below, what is the magnitude of overshoot along the negative \( y \) axis due to Gibbs phenomenon?

![Graph of a square wave](image)

No, the answer is incorrect.

Score: 0

Accepted Answers:
1.8
0.09
0.18
9

8) Consider the periodic signal \( f(t) = \sin(8\pi t) \sin(14\pi t) \). In the trigonometric Fourier series expansion of this signal, \( f(t) = a_0 + \sum_{n=1}^{\infty} \left[ a_n \cos(n\omega_0 t) + b_n \sin(n\omega_0 t) \right] \), what are the values of \( n \) for which \( a_n \neq 0 \)?

If your answer is \( n = a \) & \( n = b \), enter as \( a, b \).

No, the answer is incorrect.

Score: 0

Accepted Answers:
\((Type: \text{String})\) 3,11
9) Let \( x(t) = e^{at}u(-t) \) where \( a \) is real and positive. What is the expression for \( X(j\omega) =? \)

- \( 1/(a + j\omega) \)
- \(-1/(a + j\omega) \)
- \( 1/(a - j\omega) \)
- \(-1/(a - j\omega) \)

No, the answer is incorrect.

Score: 0

Accepted Answers:
- \( 1/(a - j\omega) \)

10) Given the Fourier transform pair \( f(t) \leftrightarrow F(j\omega) \), what is the inverse Fourier transform of \( F(j(\omega - \omega_0)) \)?

- \( e^{-j\omega_0}f(t) \)
- \( e^{j\omega_0}f(t) \)
- \( f(t - (2\pi/\omega_0)) \)
- \( f(t + (2\pi/\omega_0)) \)

No, the answer is incorrect.

Score: 0

Accepted Answers:
- \( e^{j\omega_0}f(t) \)