Assignment 07

The due date for submitting this assignment has passed. Due on 2017-09-15, 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.

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

1) What is the Fourier transform of \( f(t) = 2 \sin(\omega_0 t) \cos(\omega_c t) \)?

- \( \pi(\delta(\omega - \omega_0 - \omega_c) - \delta(\omega + \omega_0 + \omega_c) + \delta(\omega - \omega_0 + \omega_c) - \delta(\omega + \omega_0 - \omega_c)) \)
- \( -j\pi(\delta(\omega - \omega_0 - \omega_c) - \delta(\omega + \omega_0 + \omega_c) + \delta(\omega - \omega_0 + \omega_c) - \delta(\omega + \omega_0 - \omega_c)) \)
- \( \pi(\delta(\omega - \omega_0 - \omega_c) + \delta(\omega + \omega_0 + \omega_c) + \delta(\omega - \omega_0 + \omega_c) + \delta(\omega + \omega_0 - \omega_c)) \)
- \( -j\pi(\delta(\omega - \omega_0 - \omega_c) + \delta(\omega + \omega_0 + \omega_c) + \delta(\omega - \omega_0 + \omega_c) + \delta(\omega + \omega_0 - \omega_c)) \)

No, the answer is incorrect.

Score: 0

Accepted Answers:
- \(-j\pi(\delta(\omega - \omega_0 - \omega_c) - \delta(\omega + \omega_0 + \omega_c) + \delta(\omega - \omega_0 + \omega_c) - \delta(\omega + \omega_0 - \omega_c))\)

2) What is the Fourier transform of \( f(t) = \begin{cases} 2 & \text{if } t > 1 \\ 1 & \text{if } t < 1 \end{cases} \)?

- \((3\pi\delta(\omega) + \frac{1}{j\omega})e^{j\omega}\)
- \((3\pi\delta(\omega) + \frac{3}{j\omega})e^{j\omega}\)
- \((3\pi\delta(\omega) + \frac{1}{j\omega})e^{-j\omega}\)
- \((3\pi\delta(\omega) + \frac{3}{j\omega})e^{-j\omega}\)
No, the answer is incorrect.
Accepted Answers:
\((3\pi \delta(\omega) + \frac{1}{j\omega})e^{-j\omega}\)

3) Let \(f(t) \leftrightarrow F(j\omega)\) and \(F(j\omega) = \begin{cases} 2 & \omega \geq 0 \\ 0 & \omega < 0 \end{cases}\). What is \(f(t)\)?

- \(\delta(t) - \frac{1}{j\pi t}\)
- \(\delta(t) + \frac{1}{j\pi t}\)
- \(2\pi \delta(\omega) - \frac{2}{j\omega}\)
- \(2\pi \delta(\omega) + \frac{2}{j\omega}\)

No, the answer is incorrect.
Score: 0
Accepted Answers:
\(\delta(t) - \frac{1}{j\pi t}\)

4) What is the Fourier transform of \(\cos(\omega_0 t)e^{-u(t)}\)?

- \(\frac{j\omega_0 + 1}{(j\omega_0 + 1)^2 - \omega_0^2}\)
- \(\frac{j\omega_0 + 1}{(j\omega + 1)^2 + \omega_0^2}\)
- \(\frac{j\omega + 1}{(j\omega + 1)^2 - \omega_0^2}\)
- \(\frac{j\omega + 1}{(j\omega + 1)^2 + \omega_0^2}\)

No, the answer is incorrect.
Score: 0
Accepted Answers:
\(\frac{j\omega + 1}{(j\omega + 1)^2 + \omega_0^2}\)

5)
What is the Fourier transform of the Square wave shown below (periodic with period $T_0$)?

$$f(t) = A$$

$$-A$$

$$t$$

$$T_0$$

$$\frac{T_0}{2}$$

$$\sum_{n=-\infty}^{\infty} \frac{2A}{j\pi n} \delta(\omega - 2n\omega_0)$$

$$\sum_{n=-\infty}^{\infty} \frac{4A}{j\pi (2n+1)} \delta(\omega - (2n+1)\omega_0)$$

$$\sum_{n=-\infty}^{\infty} \frac{2A}{j\pi (2n+1)} \delta(\omega - (2n+1)\omega_0)$$

No, the answer is incorrect.
Score: 0
Accepted Answers:

6) For $x_1(t)$ and $x_2(t)$ shown below, what is the Fourier transform of $x_1(t) \ast x_2(t)$?

$$x_1(t)$$

$$x_2(t)$$

$$t$$

$$t$$

1 point

$$\left( \frac{\sin(\omega t)}{\omega} \right)^3$$

$$\left( \frac{2\sin \left( \frac{\omega t}{2} \right)}{\omega} \right)^3$$

$$\left( \frac{\sin(\omega t)}{\omega} \right) \left( \frac{2\sin \left( \frac{\omega t}{2} \right)}{\omega} \right)^2$$

$$\left( \frac{\sin(\omega t)}{\omega} \right)^2 \left( \frac{2\sin \left( \frac{\omega t}{2} \right)}{\omega} \right)$$

No, the answer is incorrect.
Score: 0
Accepted Answers:
7) If \( F(j\omega) \) is as shown below, what is the Inverse Fourier Transform of \( F(j\omega) \)?

![Graph of \( F(j\omega) \)]

\[
\left( \frac{2 \sin\left(\frac{\omega}{2}\right)}{\omega} \right)^3
\]

If \( F(j\omega) \) is as shown below, what is the Inverse Fourier Transform of \( F(j\omega) \)?

No, the answer is incorrect.
Score: 0
Accepted Answers:
\[
\frac{2\Lambda\omega_0}{\pi} \frac{\sin(\omega_0t/2)}{\omega_0t/2} \cos(\omega_0t)
\]
\[
\frac{\Lambda\omega_0}{\pi} \frac{\sin(\omega_0t/2)}{\omega_0t/2} \cos(\omega_0t)
\]
\[
\frac{2\Lambda\omega_0}{\pi} \frac{\sin(\omega_0t)}{\omega_0t} \cos(\omega_0t)
\]
\[
\frac{\Lambda\omega_0}{\pi} \frac{\sin(\omega_0t)}{\omega_0t} \cos(\omega_0t)
\]

8) Let \( g(t) = \int_{-\infty}^{t} f(\tau) d\tau \). If the value of \( F(j\omega) \big|_{\omega=1} \) is \( 4j \) then select the correct options:

- \( g(t) = f(t) * u(t) \)
- \( G(j\omega) = F(j\omega) \left[ \frac{1}{j\omega} + \pi \delta(\omega) \right] \)
- \( G(j\omega) = F(j\omega) \frac{1}{j\omega} + F(0) \pi \delta(\omega) \)
- \( G(j\omega) \big|_{\omega=1} = 4 \)

No, the answer is incorrect.
Score: 0
Accepted Answers:
\( g(t) = f(t) * u(t) \)
\( G(j\omega) = F(j\omega) \left[ \frac{1}{j\omega} + \pi \delta(\omega) \right] \)
\( G(j\omega) = F(j\omega) \frac{1}{j\omega} + F(0) \pi \delta(\omega) \)
\( G(j\omega) \big|_{\omega=1} = 4 \)

9) Consider the circuit shown below, and assume zero initial conditions. If \( i_s(t) = \delta(t) \) is the input to the circuit, the voltage \( v_0(t) \) measured across the 3\( \Omega \) resistor, is of the form \( a\delta(t) + be^{-ct}u(t) \). Select the correct options.
Consider the circuit shown below, and assume zero initial conditions. If \( i_s(t) = u(t) \) is the input to the circuit, the voltage \( v(t) \) measured across the 3\( \Omega \) resistor, is of the form \( ae^{-bt}u(t) \). Select the correct options.

\[
\begin{align*}
\text{No, the answer is incorrect.} \\
\text{Score: 0} \\
\text{Accepted Answers:} \\
a &= 3/4 \\
b &= -3/4 \\
c &= 1
\end{align*}
\]