



▶ Pre-course Materials

▶ Topic 1: Course Overview

▶ Topic 2: Lossless Source Coding: Hamming Codes

▶ Topic 3: The Frequency Domain

▶ Topic 4: Lossy Source Coding

▶ Topic 5: Filters and the Frequency Response

▶ Topic 6: The Discrete Fourier Transform

▶ Topic 7: Signal Transmission - Modulation

▼ Topic 8: Signal Transmission - Demodulation

8.1 Demodulation

8.2 QUIZ QUESTION 1 (1/1 point)

Suppose that a signal $\cos(2\pi \cdot 10t)$ modulates a cosinusoidal carrier $\cos(2\pi \cdot 250t)$, and then mixed with another cosine at the same frequency, i.e.

$$y(t) = \cos(2\pi \cdot 10t) \cdot \cos(2\pi \cdot 250t) \cdot \cos(2\pi \cdot 250t)$$

Which of the following is an equivalent expression for $y(t)$?



$$0.5 \cos(2\pi \cdot 250t) + 0.25 \cos(2\pi \cdot 240t) + 0.25 \cos(2\pi \cdot 260t)$$



$$0.5 \cos(2\pi \cdot 10t) + 0.25 \cos(2\pi \cdot 490t) + 0.25 \cos(2\pi \cdot 510t)$$



$$0.5 \cos(2\pi \cdot 240t) + 0.5 \cos(2\pi \cdot 260t)$$



$$\cos(2\pi \cdot 510t)$$

EXPLANATION

$$\begin{aligned} & \cos(2\pi \cdot 10t) \cdot (\cos(2\pi \cdot 250t) \cdot \cos(2\pi \cdot 250t)) \\ &= \cos(2\pi \cdot 10t) \cdot (0.5 + 0.5 \cos(2\pi \cdot 500t)) \\ &= 0.5 \cos(2\pi \cdot 10t) + 0.5 \cos(2\pi \cdot 10t) \cos(2\pi \cdot 500t) \\ &= 0.5 \cos(2\pi \cdot 10t) + 0.25 \cos(2\pi \cdot 490t) + 0.25 \cos(2\pi \cdot 510t) \end{aligned}$$

You have used 1 of 2 submissions

8.2 QUIZ QUESTION 2 (1/1 point)

Suppose that a signal with the Fourier Amplitude Spectrum $S(f)$ shown below modulates a cosine with frequency $f_0 = 400\text{Hz}$. The resulting signal is again mixed with (multiplied by) a cosine with the same frequency.

8.2 Analysis of Mixing using Cosines

Week 4 Quiz due Nov 23, 2015 at 15:30 UTC

8.3 Analysis of Mixing using Complex Exponentials

Week 4 Quiz due Nov 23, 2015 at 15:30 UTC

8.4 Filtering

Week 4 Quiz due Nov 23, 2015 at 15:30 UTC

8.5 Non-ideal Effects

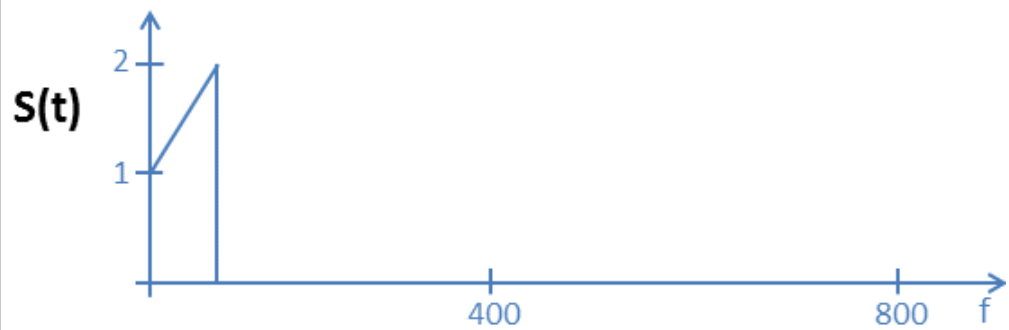
Week 4 Quiz due Nov 23, 2015 at 15:30 UTC

8.6 Lab 4 - Modulation

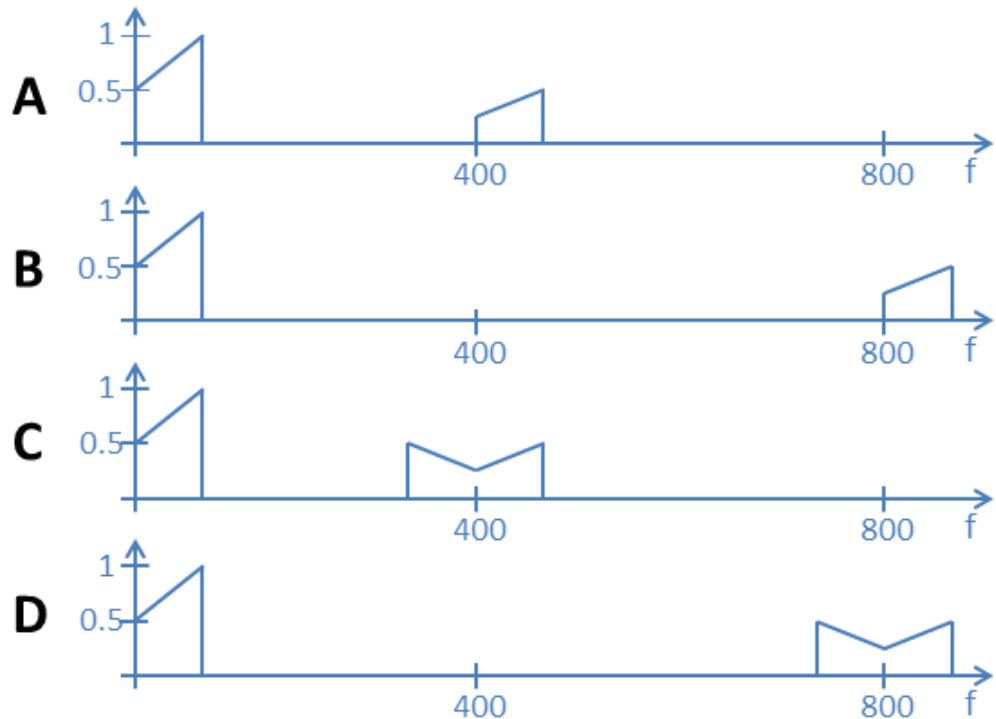
Lab due Nov 23, 2015 at 15:30 UTC

► MATLAB download and tutorials

► MATLAB Sandbox



Consider the following four amplitude spectra shown below, where frequency is given in Hertz.



Which of the above is the amplitude spectrum of the final signal?

☐ Spectrum A

☐ Spectrum B

☐ Spectrum C

☒ Spectrum D ✓

EXPLANATION

The product of two cosines with 400Hz frequency is given by

$$\cos(2 * \pi * 400 * t) \cdot \cos(2 * \pi * 400 * t) = 0.5 + 0.5 \cdot \cos(2 * \pi * 800 * t)$$

Thus, the final signal contains a copy of the original signal spectrum scaled by 0.5, and two copies of the original signal spectrum located symmetrically located symmetrically above and below 800Hz and scaled by 0.25.

You have used 2 of 2 submissions

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