Ve 216: Introduction to Signals and Systems Quiz

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Quiz 6

16:00-16:45

Quiz Rules (1)

- Your entire face must be visible at all times throughout the duration of the quiz.
- Each study group completes the quiz problems collaboratively and submits one solution set.
- Any writing after the time is up is an honor code violation. Write your group number, names and IDs before starting the quiz so that you can stop writing immediately when the time is up.
- Submit your quiz solutions as a pdf file to Canvas by 16:55. The Canvas submission will be closed at 16:55 sharp.
- In the unlikely event of a technical problem with Canvas, email your solutions to me (`yong.long@sjtu.edu.cn`) by the deadline, and then later upload when the system is working.

Quiz Rules (2)

- Your attendance will be taken at 16:10, 16:30, 16:45.
  - If you are not in the ZOOM meeting list by 16:10, your quiz score will be reduced by 30%.
  - If you are not in the ZOOM meeting list by 16:30, your quiz score will be reduced by 80%.
  - If you are not in the ZOOM meeting list by 16:45, your quiz score will be reduced by 100%.

Quiz Rules (2)

- Problems where the number of points are followed by an exclamation point are basic skill problems and will be graded without partial credit.
- Clearly $\boxed{\text{box}}$ your final answer. You will be graded on both the final answer and the steps leading to it. Correct intermediate steps will help earn partial credit.
  For full credit, ~~cross out~~ any incorrect intermediate steps.
  Simplify your answers as much as possible.
- If you need to make any additional assumptions, state them clearly.
- Legible writing will help when it comes to partial credit.

Quiz

Example (20)

Consider the input signal $x(t) = e^{-j45t} + e^{-j35t} + e^{-j25t} + e^{-j15t} + e^{-j5t} + e^{j5t} + e^{j15t} + e^{j25t} + e^{j35t} + e^{j45t}$. The signal $x(t)$ is first input to an analogy filter with impulse response

$$h_1(t) = \frac{\sin(10t)}{\pi t} + \frac{\sin(20t)}{\pi t} + \frac{\sin(30t)}{\pi t}$$

to form an output $x_1(t)$, and then $x_1(t)$ is sampled at a rate of $\omega_s = 40$ to form a sampled signal $x[n]$. The signal $x[n]$ thus obtained is then input to a lowpass filter with impluse response $h_2(t) = \frac{\sin(40t)}{\pi t}$ to reconstruct a single $z(t)$.

- Find the Fourier Transform $x_1(t)$. Simply your result when possible. [10]
- Write your expression for $z(t)$. Simply your result when possible. [10]