Lecture S9 Muddiest Points

General Comments

Today, we used Laplace transforms to find the impulse response of RC circuits, and also began analyzing aircraft phugoid motion using Laplace transforms.

Responses to Muddiest-Part-of-the-Lecture Cards

(Only 15 cards)

1. **If a circuit isn't a voltage divider, and you didn't want to use the loop or node method, how would you find $G(s)$? (1 student)** You wouldn't. You have to solve the circuit somehow to find the transfer function.

2. **Can you go over how to find the transfer function without using tricks like the voltage divider? (1)** Sure. Briefly, all you have to do is use the node method. In the example, there was only one unknown node, so it's not too hard. See me at office hours on Monday, and we'll do it together.

3. **The only thing on the mud card was the following equation:**

$$D = \frac{1}{2}\rho v^2 S C_D$$

   (1) The equation above should be a review from fluids. The drag coefficient is always defined as
$$C_D = \frac{D}{\frac{1}{2}\rho v^2 S}$$
   where D is the drag, ρ is the air density, v is the velocity, and S is the reference wing area.

4. **Trying to remember from last term: Do impedances work like resistances? (1)** Exactly.

5. **When doing Laplace transforms, why does the region of convergence matter? (1)** As we'll see, it's possible to have two different signals ($g(t)$) that have the same LT ($G(s)$), but with different regions of convergence.

6. **How did you find a, b in the impulse response of the RC circuit? (1)** I used partial fraction expansions.

7. **For the second example, why was the transfer function**

$$\frac{Z}{Z + 1/Cs}$$

   and not

$$\frac{1/Cs}{Z + 1/Cs}$$

(1) The circuit is a voltage divider. The rule for a voltage divider is that the transfer function is the impedance that is between the output terminals (in this case Z) divided by the sum of this impedance and the other impedance $(1/Cs)$ in the divider.

8. ***Will we be using Fourier [unreadable]? (1)*** We will be using Fourier transforms this term.

9. ***Just seems I need to review 8.02. (1)*** Why 8.02?

10. ***No mud. (5)*** Good.