EE3210 Signals and Systems

Assignment 5

Instructions:

1. There are two problems in this assignment. Answer all questions.
2. The total marks for this assignment is 8 marks.
3. In answering the questions, you need to note that:
   - It is important for you to show us your intermediate steps and tell us what arguments you have made to obtain the results.
   - Both the intermediate steps and the arguments carry marks.
   - If you can show us the perfect intermediate steps and the in-between arguments but get the final results wrong for some reason, we will still award you marks for having understood the subject matter.
4. The submission deadline is 23:59 Saturday 19 April 2014.
5. Late submission penalty: 20% per day will be subtracted for late submission. Submissions that are overdue for more than four days will receive **ZERO** mark.
6. Submit your assignment on e-Portal/Blackboard.
   - The file must be in Acrobat `pdf` format.
   - The file must be named with the format `Assignment5-student ID.pdf`.
     - For example, if your student ID is 12345678, the file name must be: `Assignment5-12345678.pdf`.
7. For information on how to submit assignments on e-Portal/Blackboard, see

   `http://www6.cityu.edu.hk/elearn/animation/student/submit_assignment.htm`

Problem 1: (4 marks) Consider a continuous-time LTI system that is characterized by the differential equation

$$\frac{d^2y(t)}{dt^2} + 6\frac{dy(t)}{dt} + 8y(t) = 3\frac{dx(t)}{dt} + 9x(t).$$

(a) Find the frequency response $H(\omega)$ of this system.

(b) Determine the magnitude response $|H(\omega)|$ of this system.

(c) Find the unit impulse response $h(t)$ of this system from $H(\omega)$.

(d) Use frequency-domain analysis to determine the response $y(t)$ of this system when the input $x(t)$ is given by

$$x(t) = \left[e^{-t} + e^{-3t}\right] u(t).$$

Problem 2: (4 marks) Consider the discrete-time LTI system in Tutorial 5 Problem 2, i.e., with unit impulse response $h[n] = 4^n u[2-n]$ and input signal $x[n] = (-\frac{1}{2})^n u[n-4]$.

(a) Compute the Fourier transform of $x[n]$.

(b) Determine the frequency response $H[\Omega]$ of this system.

(c) Determine the magnitude response $|H[\Omega]|$ of this system.

(d) Use frequency-domain analysis to determine the response $y[n]$ of this system.

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