Differential Equations Test III Overview

Test III covers Chapters 7 and 8 primarily. The in-class portion of the test covers Laplace Transforms and section 8.1-8.4 of the text. Sections 8.5-8.7 and certain time-consuming aspects of 8.1-8.4 will be covered by the take-home portion of Test III. (the take-home part of the test will match some of the Problem Set III problems you already completed, if you got them correct then you have no work to do on the take-home. In particular the take-home is Problems 27 and 29 of Problem Set III.)

The closed book timed portion of the test is worth 60pts. Laplace techinques will be 50pts, the remaining 10pts will be simple series problems as described below.

As always your first best line of defense is to complete and understand the Problem Set, Practice Homework and lecture examples. I should mention that I have integrated a number of old test questions into the lecture notes. You will get a sheet with the basic Laplace transforms and the basic theorems, there is a copy of the formula sheet posted on the webpage. You will also be permitted a 3x5 card to help remember series material (you can put whatever you want, but I intend it for series formulas)

1. Be able to derive trigonometric identities.

2. Know the explicit definition of the Laplace transform (it is an improper integral).

3. Know how to use the table of Laplace transforms.

4. Know how to use algebra and/or trig. identities to place expressions in a form which has a known Laplace transform.

5. Be able to convert a differential equation to an algebraic equation via the Laplace transform.

6. Be careful with notation, you will lose points for ignoring the difference between y and Y.

7. Know how to use the table of Laplace transforms to take inverse Laplace transforms.

8. Know how to use partial fractions to place expressions in a form which has a known inverse Laplace transform.

9. Be fluent in converting piecewise defined functions to those written with Heaviside (aka unit step) functions.

10. Know about the quirks of discontinuous functions, how to Laplace transform them etc...

11. What is a Dirac Delta function? Be able to find its Laplace transform from the definition of the Laplace transform (this is a very easy integration)

12. Be able to solve differential equations by the method of Laplace.

13. Know the major theorems (8,9,11,eqn 4, eqn 6, eqn 8) on the sheet for the test.

14. Convolutions are useful and interesting but these are not part of the required material and will not be tested.

15. Periodic functions can be dealt with via Laplace Transforms however, this is not part of the required material and will not be tested. *I include notes on Periodic functions and convolutions because you should be aware of these techniques and you might need to learn them later for an engineering course.*

16. know your basic series expansions and/or put them on your 3x5 card.

17. be able to relable series as to find general formulas and or combine sums with mismatched indices. (see pages 158-161 of my notes in particular)

18. be able to find first few nontrivial terms in series solution of a linear ODE with analytic coefficients. (like E168 also PH-99 through PH-103)

19. Frobenius is not on closed book part of test, we'll save it for the take-home.