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Ma 221 **Exam II B** **12S**

I pledge my honor that I have abided by the Stevens Honor System.

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You may not use a calculator, **cell phone**, **or computer while taking this exam**. **All work must be shown to obtain full credit**. **Credit will not be given for work not reasonably supported**. **When you finish**, **be sure to sign the pledge**.

Note: A table of selected integrals appears on the last page of this exam.

Score on Problem #1a _____

#1b _____

#1c _____

#1d _____

#2 _____

#3 _____

#4 _____

Total Score _____

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1. (40 **pts**. **total**) Consider the Initial Value Problem

$$y'' - 2y' + y = t^2 + 1 - e^{-t} \qquad y(0) = 0 \;\; y'(0) = 2$$

1 a (6 **pts**.) Find the homogeneous solution of this equation.

1 b (20 **pts**.) Find a particular solution of this equation.

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1 c (4 **pts**.) Give a general solution of this equation.

1d (10 **pts**.) Find the solution to this Initial Value Problem

$$y'' - 2y' + y = t^2 + 1 - e^{-t} \qquad y(0) = 0 \;\; y'(0) = 2$$

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2 (20 **pts**.) Find a general solution of

$$t^2y'' - ty' + 5y = 0$$

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3 (25 **pts**.) Find a general solution of the differential equation

$$y'' + 6y' + 9y = t^{-3}e^{-3t}$$

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4 (15 **pts**.) Write down a second order homogeneous linear differential equation with real constant coefficients of the form

$$y'' + by' + cy = 0$$

whose solutions are

$$\frac{1}{3}e^{-4x}\cos 3x \text{ and } \frac{2e^{-4x}}{3}\sin 3x.$$

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Table of Integrals

$$\int \ln t dt = t(\ln t - 1) + C$$

$$\int (\ln t)^2 dt = t\left(\ln^2 t - 2\ln t + 2\right) + C$$

$$\int \frac{\ln t}{t} dt = \frac{1}{2}\ln^2 t + C$$

$$\int \frac{(\ln t)^2}{t} dt + C = \frac{1}{3}\ln^3 t + C$$