

**NE 150 - Introduction to Nuclear Reactor Theory**  
**Spring 2007**

**Homework #7 - Kinetics II**

Due May 1<sup>st</sup>, 2007

1. Show the detailed derivation of the point kinetics equations (3.51a and 3.51b) beginning with the time dependent diffusion equation (Eq. 3.28).
2. Show the solution of the point kinetics equations for one-group of delayed neutrons (i.e. begin with Eqs. 3.51 and show the derivation of Eq. 6.109).
3. This problem will use the kinetics equation for a single group of delayed neutrons (Eq. 6.109) with the kinetics parameters for a single group of delayed neutrons:

$$\beta = 0.0065$$

$$\lambda = 0.08s^{-1}$$

$$\Lambda = 0.001s$$

Calculate (and plot) the power response as a function of time (0-2 seconds) for the following step reactivity insertions:

a. 0.00022

b. 0.00220

c. 0.02200

For each case, show on the same plot each of the two terms of Eq. 6.109 as well as the total power. Discuss each solution in detail.