

**22.351 Systems Analysis of the Nuclear Fuel Cycle  
Spring 2003**

**Problem Set#3**

**60% Problem 1:** It is desired to operate LWRs in the future to 30% higher burnup than possible today.

List all the ways in which the following professionals can alter the reactivity of a reactor core to achieve that objective

- (a) The reactor designer
  
- (b) The nuclear fuel manager
  
- (c) The reactor operator

**40% Problem 2** In a proposed design for supercritical water reactor ( where the water pressure is above the critical pressure of 22.2 MPa) , the density of water coolant changes by a factor of 5 from the entry at the bottom of the core to the exit at the top of the core. This is a larger density difference than typical of BWRs. It is proposed to use either a solid, like zirconium hydride or relatively cold water in by bypass tubes in the core to ensure sufficient moderation near the core exit. Discuss the pros and cons of each design from the operations and safety points of view,