

## Problem Set 8

### Ses #23

#### Question 1

A point source of strength  $S_p$  is located at the center of a sphere of a non-multiplying medium with properties  $D$  and  $\Sigma_a$ , and an extrapolated radius  $R_{exp}$ , in an infinite vacuum.

Find the flux distribution in the sphere

#### Question 2

Consider a finite cylindrical reactor with the following properties

$$v\Sigma_f = 0.08 \text{ cm}^{-1}$$

$$\Sigma_a = 0.062 \text{ cm}^{-1}$$

$$D = 0.90$$

$$\text{True core height (H)} = 4 \text{ m}$$

$$\text{True core radius (R)} = 3 \text{ m}$$

(Don't forget to account for the extrapolated radius)

Calculate the eigenvalue of this reactor

#### Question 3

Solve the point kinetics equations with a single precursor group for an initially critical reactor for a step insertion of positive reactivity of 0.9\$. (i.e. provide analytical solution).

Assume that the initial reactor power is  $P_0$  and that the precursors are at equilibrium.

Sketch both the reactor power and precursor concentration as a function of time. Show the details of your calculations. Assume the following parameters:

$$\beta = 0.006$$

$$\lambda = 0.1 \text{ s}^{-1}$$

$$\Lambda = 0.00001 \text{ s}$$

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