Nuclear Engineering 150 – Discussion Section
Team Exercise Solutions #12

Problem 1

Consider a sphere composed of a homogeneous multiplying medium, and surrounded by a reflecting shell of non-multiplying material with a thickness equal to half the radius of the sphere. Outside of the reflector is vacuum.

a) Write the diffusion equation and boundary conditions describing this system.

b) Calculate the flux in both regions that are not vacuum.

c) Determine the reflector savings.

Problem 1 Solution

a)

b)

c)

Problem 2

Consider a bare sphere composed of a homogeneous multiplying medium.

a) Give the steady-state, continuous energy diffusion equation. Assume that the diffusion coefficient (D) and the average neutrons produced from fission (ν) are constant for all energies.

b) Derive the multigroup equation corresponding to the case where there are three energy groups. Assume that there is no upscattering, all groups are directly coupled (no inscattering), and fission is only induced by the slowest group while only producing neutrons in the fastest group.

c) Write the multigroup equation you found as a matrix-equation.

Problem 2 Solution

a)

b)

c)