NUEN 629, Homework 2

Due Date Oct. 6

1 Childs

(35 points) Compute three group cross-sections for a homogeneous mixture of graphite and natural uranium where the ratio of graphite to uranium is 150:1. You can assume the Watt-fission spectrum, and that the group bounds are $\{0, 1\,\mathrm{eV}, 100\,\mathrm{keV}, 20\,\mathrm{MeV}\}$.

2 Franklin

(40 points) The enclosed file gives the microscopic cross-sections for ^{1}H in units of barns for 5 groups as calculated by the code NJOY. Imagine we have a large, nearly infinite tank of high-pressure hydrogen, 30 atm, next to a bare sphere of ^{235}U. Compute the scalar flux ϕ_g and the current $\vec{J}_g$ in the hydrogen using the separable, P1 equivalent, and extended Legendre approximations. Compare your solutions graphically.

3 Geer

(25 points) Find the solution to the diffusion equation for 1-group, slab geometry, where the material is a pure scatter and the slab width is X under the following conditions

1. Vacuum Marshak conditions

2. Vacuum Mark conditions

3. Vacuum Dirichlet conditions

4. Vacuum Dirichlet condition on the left and albedo on the right at $X/2$, and

5. Vacuum Dirichlet condition on the left and reflecting on the right at $X/2$.

Compare the solutions and comment on the similarities and differences.