Relevant information:

Thermal neutron cross section for U-235: 570 barns

1 eV = 1.602E-19 J

Density of UO2: 10.97 g/cc

Si (Z=14, A=28)

Pay attention to units!

Explain the difference between fertile, fissile and fissionable.

What is the secondary fissile element in typical commercial fuel? How is it formed?

What does TRISO stand for? Identify the layers in a TRISO particle. Provide an example of a reactor that utilizes TRISO-based fuel.

What is the compound that uranium is converted into for enrichment purposes?

Which noble gas has a lower thermal conductivity, He or Xe?

Outline and describe the entire fabrication process of the fuel.

Name two primary fission product species. Provide justification.

What is the role of cladding?

What are the three ways that space is discretized for numerical solutions?

U3Si5 is a uranium silicide fuel being considered for use in light water reactors. It has

a thermal conductivity of 12.5 W/(m-K), an enrichment of 5% and a density of 8.97 g/cm3. Answer the following questions:

What is the heat generation rate for U3Si5 given a neutron flux of 3E13 n/cm2-s?

Given a fuel radius of 0.45 cm, what is the temperature drop over the fuel pellet?

What enrichment of UO2 would be required to obtain the same heat generation rate?

Which coolant sees a larger change in outlet to inlet temperature? 1) water: CP = 4200 J/kg-K, mdot = 0.25 kg/s-rod, Z0 = 1.5 m; 2) sodium: CP=1404 J/kg-K, mdot = 1.2 kg/s/rod, Z0=0.5 m.

Given a rod of 2 m in length and an LHR0 = 150 W/cm, what is the LHR at z=1.6 m?

Perform a forward Euler time stepping to approximate the following function: y(t) = e-2t

Compute with timesteps dt=0.5 and dt=0.25, expanding to tn=1.

Consider a metallic (UZr) fuel slug with a radius of 0.3 cm, a sodium gap of 0.1 cm, an HT9 cladding thickness of 0.05 cm. UZr thermal conductivity = 0.22 W/cm-K; Na thermal conductivity = 0.5 W/cm-K; hcool = 5.5 W/cm-K; HT9 thermal conductivity = 20 W/m-K; Tcool= 400 K; Q = 550 W/cm3

What is the temperature at r=0.15 cm?