Homework 05 (20Nov24)

Name: `your name`

Guidance:

- Upload your answers in the Blackboard submission portal as:

  lastname-firstname-homework-xx.pdf or **lastname-firstname-homework-xx.ipynb**

Table of Problems

Problem 1 (30 pts)

Using the simple neutron generation balance for a chain fission reactor covered in the classroom, please answer the questions below:

1.1)(25 pts) Derive the function for the normalized number of neutrons varying with time in the limit of neutron multiplication factor $k \approx 1$. State the assumptions and show the mathematical derivation when the neutron mean lifetime is denoted ℓ.

Answer:

1.2)(25 pts) Make a plot of the function derived in 1.1) for the cases: supercritical, critical, and subcritical?

Answer:

1.3)(25 pts) In shuting down a chain reactor one has a negative reactivity $\rho = -0.01$. What is the neutron population lifetime τ when the neutron lifetime is $\ell = 0.1$ ms? What is the normalized population at $t = \tau$, and $t = 5\,\tau$?

Answer:

1.4)(25 pts) If an operation of the reactor leads to a reactivity of $\rho = 0.01$, what is the doubling period of the neutron population for $\ell = 0.1$ ms? What is the normalized population of neutrons after 1 s, and after 10 s? Explain your results. Why is this model behaving like this?

Answer: