

GNG 4128 Introduction to Nuclear Engineering

Instructor: Nabel Sadek

Quiz #4

Allowed: 45 minutes

Date: April 3 / 2018

Time

Name :

Student ID:

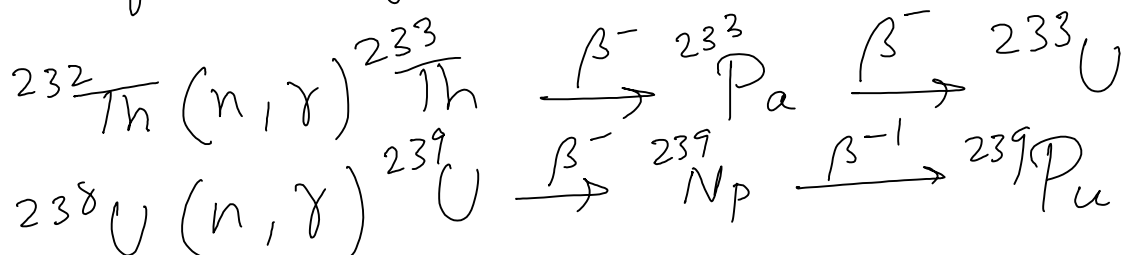
1. Calculate the burnup value for 1 year's operation of a 3000-MWt power reactor with an initial U-235 fuel loading of 2800 kg; with an enrichment of 3 w/o. (4 points)
2. List the two most important fissile isotopes produced artificially. What are the nuclear reactions that lead to their production? (3 points)
3. List and briefly explain the technology goals of Generation IV nuclear systems. (3 points)

(3 points)

① Burnup is defined as the amount of energy released by a given amount of fuel. Based on this definition
$$\text{Burnup} = 3000 \times 365 = 1095000 \text{ MW-day}$$
$$= 1095 \text{ GW-day}$$

Definition is not required

② The most important fissile isotopes bred in reactors are U-233 & Pu-239 through the following reactions



③

- 1- Sustainability :-
sustainable fuel supply and minimization of nuclear waste
- 2- Economics
prices must be competitive.
financial risk must be comparable to other energy projects
- 3- Safety and reliability
Gen. IV must excel in safety and reliability, and eliminate the need for off-site emergency response.
- 4- Proliferation resistance and physical protection
Gen. IV must provide increased physical protection against malicious acts and must be unattractive for diversion or theft as weapon-usable materials