

(19.7) A large homogeneous thermal reactor contains only ^{235}U dispersed in beryllium in the atomic ratio $1:3 \cdot 10^4$. The migration area is 0.023 m^2 . Assuming $p = \epsilon = 1$, calculate the size of a cylindrical reactor with height equal to diameter.

$$M2 := 0.023 \cdot \text{m}^2 \quad \text{Migration area given in text above}$$

$$\text{Sigma}_{fuel} := 582.2 + 98.6 \quad \text{From Table 19.2 for thermal neutrons}$$

$$\text{Sigma}_{mod} := 3 \cdot 10^4 \cdot 0.009 \quad \text{From Table 19.3 and atomic ratio given in text}$$

$$f := \frac{\text{Sigma}_{fuel}}{\text{Sigma}_{fuel} + \text{Sigma}_{mod}} \quad f = 0.716 \quad \text{Eqn. (19.13)}$$

$$\eta := 2.068 \quad \epsilon := 1 \quad p := 1 \quad \text{From Table 19.2 and data given in text}$$

$$k_{inf} := \eta \cdot \epsilon \cdot p \cdot f \quad k_{inf} = 1.481 \quad \text{Eqn. (19.12)}$$

$$B2 := \frac{(k_{inf} - 1)}{M2} \quad B2 = 20.902 \cdot \text{m}^{-2} \quad \text{From right part of eqn. (19.19)}$$

$$B2 = 33 \cdot b^{-2} \quad \text{Eqn. (19.21c) gives:} \quad b := \sqrt{\frac{33}{B2}} \quad b = 1.257 \cdot \text{m}$$