

원자로 동력학 1 기말고사

2004. 6. 16

1. initially critical reactor에서 exact PKEs를 유도하시오.(30점)

Time-dependent diffusion equation: $\frac{1}{v} \frac{\partial \Phi}{\partial t} = (F_p - M)\Phi + S_d$

cf. constraint condition for the shape function:

$$\int_V \int_0^\infty \frac{\phi_0^*(\mathbf{r}, E) \phi(\mathbf{r}, E, t)}{\nu(E)} dE dV = K_0.$$

Definitions:
$$\Lambda(t) = \frac{(\Phi_0^*, \frac{1}{v} \Psi)}{(\Phi_0^*, F \Psi)} = \frac{K_0}{F(t)}$$

and
$$\rho(t) = \frac{1}{F(t)} (\Phi_0^*, [F - M] \Psi) \text{ or } \rho(t) = \frac{1}{F(t)} (\Phi_0^*, [\Delta F - \Delta M] \Psi)$$

and
$$\beta(t) = \frac{1}{F(t)} (\Phi_0^*, F_d \Psi) = \sum_k \beta_k(t)$$

with
$$\beta_k(t) = \frac{1}{F(t)} (\Phi_0^*, F_{dk} \Psi) \text{ and } \zeta_k(t) = \frac{1}{F_0} (\Phi_0^*, \lambda_{dk} C_k).$$

2. exact static reactivity increment에 대한 다음 공식을 유도하시오 (15점)

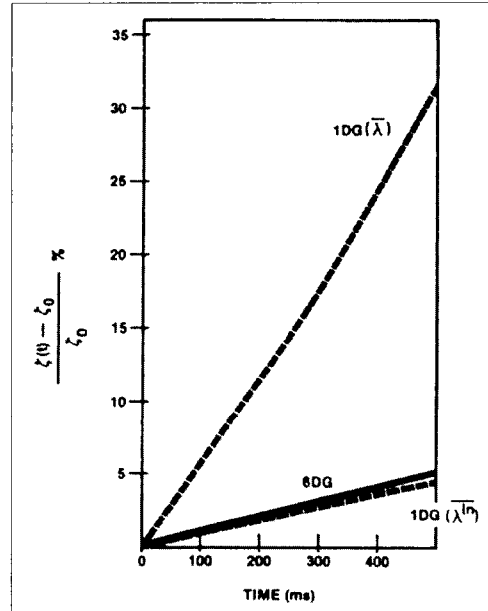
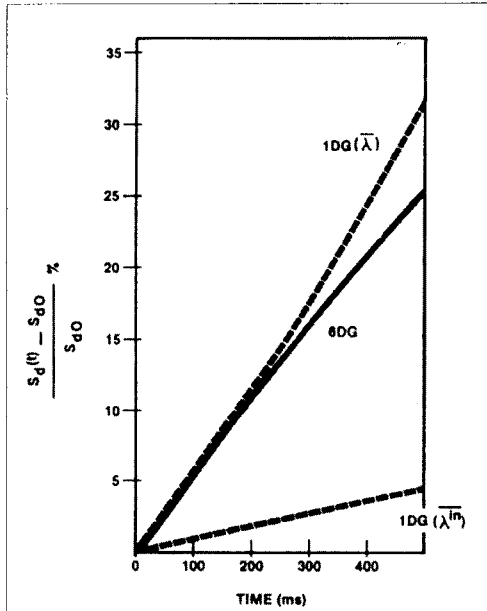
a.
$$\Delta \rho = \frac{(\Phi_0^*, [\lambda_0 \Delta F - \Delta M] \Phi)}{(\Phi_0^*, F \Phi)}$$

b.
$$\Delta \rho = \frac{(\Phi_0^*, [\lambda \Delta F - \Delta M] \Phi)}{(\Phi_0^*, F_0 \Phi)}$$

3. CDS와 PA 근사 방법에 대하여 설명하시오. (15점)

4. Precursor balance equation $\frac{d\xi_k(t)}{dt} = -\lambda_k \xi_k(t) + \beta_k p(t)$ 을 사용하여 테일러 전개로 $\xi(t)$ 와 $s_d(t)$ 를 구하시오. 그리고 이 결과를 사용하여 아래 두 그림이 의미하는 바를 설명하시오. (30점)

Handwritten notes:
 $\xi(t) = \xi_0 + \lambda_0 t + \dots$
 $s_d(t) = s_{d0} + \lambda_0 t + \dots$



5. 빈 칸을 채워넣으시오.(10점)

