Example of Answers

International Master's Programs of Chemical Engineering in the Graduate School of Engineering, Kyushu University (Academic Year from October, 2026)

Subject : Reaction Engineering　(1 sheet)

1.

(1.1)

$$C_{A,out} = C_{Ao}\exp(-k\tau)$$

(1.2)

$$X_A = 1 - \exp(-k\tau)$$

(1.3)

PFR achieves higher conversion than CSTR.

CSTR has a low reaction rate because it starts with a low concentration at the exit. PFR can proceed with the reaction using a high concentration at the inlet.

2.

(2.1)

$$-r_{O3} = \frac{2k_1k_2[O_3]^2[M]}{k_{-1}[O_2][M] + k_2[O_3]}$$

(2.2)

$$y_{O2} = 0.0732$$

(2.3)

if

$$k_2[O_3] >> k_{-1}[O_2][M]$$

$$-r_{O_3} \simeq \frac{2k_1k_2[O_3]^2[M]}{k_2[O_3]} = 2k_1[O_3][M]$$

$$[M] = const$$

$$-r_{O_3} = K[O_3]$$