Example Answers

International Master's Programs of Chemical Engineering in the Graduate School of Engineering, Kyushu University (Academic Year from October, 2025)

Subject: Mass Transfer (1 sheet)

1.

(1.1) $B_1 = -1$, $B_2 = 0$, $B_3 = -2$, $B_4 = 0$.
The rationale could be, (1) because the Laplacian in cylindrical coordinates is

$$\nabla^2 = \frac{1}{r}\frac{\partial}{\partial r} + \frac{\partial^2}{\partial r^2} + \frac{1}{r^2}\frac{\partial^2}{\partial \varphi^2} + \frac{\partial^2}{\partial z^2},$$

or (2) each term should be of the same dimension as the Laplacian, $(\text{length})^{-2}$.

(1.2)

$$\frac{\partial C_A}{\partial t} = D\frac{\partial^2 C_A}{\partial z^2} - \frac{2kC_A}{R}.$$

2.

(2.1) 1.39×10^{-2} mol $\text{m}^{-2}\text{s}^{-1}$

(2.2) 4.7