5

CW.

9. CME from question 2:

$$\frac{\partial P_n}{\partial t} = P_{n-1}\left(k_1(N-n+1) + \frac{k_2}{v}(n-1)(N-n+1) + \frac{k_3}{v^2}(n-1)(n-2)(N-n+1)\right)$$

$$+ P_{n+1}\left(k_1(n+1) + \frac{k_2}{v}(n+1)(N-n-1) + \frac{k_3}{v^2}(n+1)(N-n-1)(N-n-2)\right)$$

$$- P_n\left(k_1 N + 2\frac{k_2}{v}n(N-n) + \frac{k_3}{v^2}n(N-n)(N-2)\right)$$

Using steady state:

$$0 = \phi(n-1)\left(k_1(N-n+1) + \frac{k_2}{v}(n-1)(N-n+1) + \frac{k_3}{v^2}(n-1)(n-2)(N-n+1)\right)$$

$$+ \phi(n+1)\left(k_1(n+1) + \frac{k_2}{v}(n+1)(N-n-1) + \frac{k_3}{v^2}(n+1)(N-n-1)(N-n-2)\right)$$

$$- \phi(n)\left(k_1 N + 2\frac{k_2}{v}n(N-n) + \frac{k_3}{v^2}n(N-n)(N-2)\right)$$

$$\Rightarrow \quad 0 = \phi(1)\left(k_1 + \frac{k_2}{v}(N-1) + \frac{k_3}{v^2}(N-1)(N-2)\right) - \phi(0)\,k_1 N$$

$$\begin{cases} \phi(1) = \dfrac{k_1 N}{k_1 + \frac{k_2}{v}(N-1) + \frac{k_3}{v^2}(N-1)(N-2)} \cdot \phi(0) \\[2ex] \phi(n+1) = \phi(n)\left(k_1 N + 2\frac{k_2}{v}n(N-n) + \frac{k_3}{v^2}n(N-n)(N-2)\right) \\ \qquad - \phi(n-1)\left(k_1(N-n+1) + \frac{k_2}{v}(n-1)(N-n+1) + \frac{k_3}{v^2}(n-1)(n-2)(N-n+1)\right), \end{cases}$$

$n \geq 1$