Без отбора

$$\frac{dc}{dn}=\varepsilon c(1-c)$$

$$\frac{dc}{c(1-c)}=\varepsilon dn$$

$$\int_{c_0}^{c}\frac{dc}{c(1-c)}=\int_{0}^{n}\varepsilon dn$$

$$\int_{c_0}^{c}\left(\frac{Adc}{c}+\frac{Bdc}{(1-c)}\right)=\varepsilon dn\Big|_0^n$$

$$\int_{c_0}^{c}\left(\frac{Adc}{c}+\frac{Bdc}{(1-c)}\right)=\varepsilon dn\Big|_0^n,\ A(1-c)+Bc=1,\ \begin{cases}A=1\\B-A=0\end{cases}\rightarrow\begin{cases}A=1\\B=1\end{cases}$$

$$\int_{c_0}^{c}\left(\frac{dc}{c}+\frac{dc}{(1-c)}\right)=\varepsilon dn\Big|_0^n$$

$$\ln(c)\Big|_{c_0}^{c}+\int_{c_0}^{c}\left(-\frac{d(1-c)}{(1-c)}\right)=\varepsilon n$$

$$\ln(c)\Big|_{c_0}^{c}-\ln((1-c))\Big|_{c_0}^{c}=\varepsilon n$$

$$\ln\left(\frac{c}{(1-c)}\right)\Bigg|_{c_0}^{c}=\varepsilon n$$

$$\ln\left(\frac{c}{(1-c)}\cdot\frac{(1-c_0)}{c_0}\right)=\varepsilon n$$

$$\frac{c}{(1-c)}\cdot\frac{(1-c_0)}{c_0}=e^{\varepsilon n}$$

$$c=\frac{c_0}{(1-c_0)}e^{\varepsilon n}(1-c)$$

$$c\left(1+\frac{c_0}{(1-c_0)}e^{\varepsilon n}\right)=\frac{c_0}{(1-c_0)}e^{\varepsilon n}$$

$$c = \frac{\frac{c_0}{\left(1-c_0\right)} e^{\varepsilon n}}{\left(1+\frac{c_0}{\left(1-c_0\right)} e^{\varepsilon n}\right)}, \quad \begin{array}{l} n = 0, 20, 40 \ldots 20 \cdot N \\ c_0 = c_W \end{array}$$

С отбором

$$\frac{dc}{dn}=\varepsilon c(1-c)-\frac{P}{L}(c_P-c)$$

$$\frac{dc}{\varepsilon c(1-c)-\frac{P}{L}(c_P-c)}=dn$$

$$\int\limits_{c_0}^{c}\frac{dc}{\varepsilon c(1-c)-\frac{P}{L}(c_P-c)}=\int\limits_{0}^{n}dn$$

$$\int\limits_{c_0}^{c}\frac{dc}{\varepsilon c(1-c)-\frac{P}{L}(c_P-c)}=n\Big|_0^n$$

$$\varepsilon c(1-c)-\frac{P}{L}(c_P-c)$$

$$\varepsilon c-\varepsilon c^2-\frac{P}{L}c_P+\frac{P}{L}c$$

$$-\varepsilon c^2+\left(\varepsilon+\frac{P}{L}\right)-\frac{P}{L}c_P$$

$$D=\left(\varepsilon+\frac{P}{L}\right)^2-4\varepsilon\frac{P}{L}c_P$$

$$x_{1,2}=\frac{-\left(\varepsilon+\frac{P}{L}\right)\pm\sqrt{\left(\varepsilon+\frac{P}{L}\right)^2-4\varepsilon\frac{P}{L}c_P}}{-2\varepsilon}$$

$$x_{1,2}=\frac{1}{2}\left(1+\frac{P}{L\varepsilon}\right)\pm\sqrt{\frac{1}{4}\left(1+\frac{P}{L\varepsilon}\right)^2-\frac{P}{L\varepsilon}c_P}$$

$$\varepsilon c(1-c)-\frac{P}{L}(c_P-c)=-\varepsilon(c-x_1)(c-x_2)=\varepsilon(x_1-c)(c-x_2)$$

$$\frac{1}{\varepsilon}\int\limits_{c_0}^{c}\frac{dc}{(x_1-c)(c-x_2)}=n$$

$$\frac{1}{\varepsilon}\int\limits_{c_0}^{c}\left(\frac{Adc}{(x_1-c)}+\frac{Bdc}{(c-x_2)}\right)=n,\ A(c-x_2)+B(x_1-c)=1,$$

$$\begin{cases}-Ax_2+Bx_1=1\\ A-B=0\end{cases}\to\begin{cases}A=B\\ A(x_1-x_2)=1\end{cases}\to A=B=\frac{1}{(x_1-x_2)}$$

$$\frac{1}{\varepsilon(x_1-x_2)}\int_{c_0}^{c}\left(\frac{dc}{(x_1-c)}+\frac{dc}{(c-x_2)}\right)=n$$

$$\frac{1}{\varepsilon(x_1-x_2)}\int_{c_0}^{c}\left(-\frac{d(x_1-c)}{(x_1-c)}+\frac{d(c-x_2)}{(c-x_2)}\right)=n$$

$$\frac{1}{\varepsilon(x_1-x_2)}\left(-\ln(x_1-c)+\ln(c-x_2)\right)\Big|_{c_0}^{c}=n$$

$$\frac{1}{\varepsilon(x_1-x_2)}\left(\ln\frac{(c-x_2)}{(x_1-c)}\right)\Bigg|_{c_0}^{c}=n$$

$$\frac{1}{\varepsilon(x_1-x_2)}\ln\frac{(c-x_2)(x_1-c_0)}{(x_1-c)(c_0-x_2)}=n$$

$$\ln\frac{(c-x_2)(x_1-c_0)}{(x_1-c)(c_0-x_2)}=n\varepsilon(x_1-x_2)$$

$$\frac{(c-x_2)(x_1-c_0)}{(x_1-c)(c_0-x_2)}=e^{n\varepsilon(x_1-x_2)}$$

$$\frac{(c-x_2)}{(x_1-c)}=\frac{(c_0-x_2)}{(x_1-c_0)}e^{n\varepsilon(x_1-x_2)}$$

$$(c-x_2)=\frac{(c_0-x_2)}{(x_1-c_0)}e^{n\varepsilon(x_1-x_2)}\cdot(x_1-c)$$

$$c\left(1+\frac{(c_0-x_2)}{(x_1-c_0)}e^{n\varepsilon(x_1-x_2)}\right)=\frac{(c_0-x_2)}{(x_1-c_0)}e^{n\varepsilon(x_1-x_2)}x_1+x_2$$

$$c=\frac{\frac{(c_0-x_2)}{(x_1-c_0)}e^{n\varepsilon(x_1-x_2)}x_1+x_2}{\left(1+\frac{(c_0-x_2)}{(x_1-c_0)}e^{n\varepsilon(x_1-x_2)}\right)},$$

$$x_{1,2}=\frac{1}{2}\left(1+\frac{P}{L\varepsilon}\right)\pm\sqrt{\frac{1}{4}\left(1+\frac{P}{L\varepsilon}\right)^2-\frac{P}{L\varepsilon}c_P},$$

$$n=0,20,40\ldots20\cdot N$$

$$c_0=c_W$$

Поток L:

$$L_{нач} = \frac{2P\left(c_P - c_F\right)}{\varepsilon c_F\left(1-c_F\right)} \text{ - К1, ТТ1}$$

$$L_{вых1} = \left(1-r\right)L_{нач} \text{ - К1, ТТ1}$$

$$L_{вх2} = L_{вых1} \text{ - К1, ТТ2}$$

$$L_{вых2} = \left(1-r\right)L_{вх2} \text{ - К1, ТТ2}$$

$$\ldots$$

$$L_{вх20} = L_{вых19}$$

$$L_{вых20} = \left(1-r\right)L_{вх20}$$

Геометрическая прогрессия:

По ТТ:

$$L_{вых}\left(n\right) = L_{нач}\left(1-r\right)^n, n = 1,2..20\cdot N$$

$$L_{вх}\left(n\right) = L_{нач}\left(1-r\right)^n, n = 0,1,..20\cdot\left(N-1\right)$$

По К:

$$L_{вых}\left(n\right) = L_{нач}\left(1-r\right)^{20n}, n = 1,2..N$$

$$L_{вх}\left(n\right) = L_{нач}\left(1-r\right)^{20n}, n = 0,1,2..N-1$$

$$L_{вх}\left(n\right) = L_{нач}\left(1-r\right)^{20(n-1)}, n = 1,2..N$$

$$L_{ср}\left(n\right) = \frac{L_{вых}\left(n\right) + L_{вх}\left(n\right)}{2}, n = 1,2..N$$

$$L_{ср}\left(n\right) = \frac{L_{нач}\left(1-r\right)^{20n} + L_{нач}\left(1-r\right)^{20(n-1)}}{2}, n = 1,2..N$$

$$L_{ср}\left(n\right) = \frac{L_{нач}\left(1-r\right)^{20n} + L_{нач}\left(1-r\right)^{20n}\cdot\left(1-r\right)^{-20}}{2}, n = 1,2..N$$

$$L_{ср}\left(n\right) = \frac{2L_{нач}\left(1-r\right)^{20n}\cdot\left(1+\left(1-r\right)^{-20}\right)}{2}, n = 1,2..N$$

$$L_{ср}\left(n\right) = L_{нач}\left(1-r\right)^{20n}\cdot\left(1+\left(1-r\right)^{-20}\right), n = 1,2..N$$