Варианты самостоятельной работы.

Система "муравейник"

① $\dot{u}_i = u_i(\alpha u_4 - \bar{f})$ $i=1,2,3$
$\dot{u}_4 = u_4(\beta S - \bar{f})$

⑦ [illegible]

⑧ #

② $\dot{u}_i = u_i(\alpha u_4 + k_1 u_{i-1} - \bar{f})$, $i=1,2,3$ $u_0 = u_3$
$\dot{u}_4 = u_4(\beta S - \bar{f})$

③ $\dot{u}_i = u_i(\alpha u_4 + k_1 u_{i-2} + k_2 u_{i-1})$, $i=1,2,3$, $u_0 = u_3$
$\dot{u}_4 = u_4(\beta S - \bar{f})$

④ $\dot{u}_i = u_i(\alpha u_4 - \bar{f})$ $i=1,2,3$
$\dot{u}_4 = u_4(\sum_{i=1}^{3} \beta_i u_i - \bar{f})$

⑤ $\dot{u}_i = u_i(\alpha \sqrt{u_4} - \bar{f})$ $i=1,2,3$
$\dot{u}_4 = u_4(\beta S - \bar{f})$

⑥ $\dot{u}_i = u_i(\alpha u_4^2 - \bar{f})$ $i=1,2,3$
$\dot{u}_4 = u_4(\beta S - \bar{f})$

$u_1 + u_2 + u_3 + u_4 = 1$, $u_k \geq 0$, $k=1,2,3,4$.

$S = u_1 + u_2 + u_3$

$\alpha = 0,1$, $k_2 = k_1 = 0,01$.

$\beta_1 = 0,01$, $\beta_2 = 0,02$, $\beta_3 = 0,03$.