$$C_{1,t} = (k_{21}\,k_{e2}\,(\frac{d}{dt}\,x_1(t))\,k_{41} + k_{21}\,k_{41}\,(\frac{d}{dt}\,x_1(t))\,k_{31} \tag{1}$$

$$+k_{21}\,k_{e2}\,(\frac{d}{dt}\,x_1(t))\,k_{31} + k_{21}\,k_{41}\,k_{e1}\,(\frac{d}{dt}\,x_1(t)) + k_{21}\,k_{e1}\,(\frac{d}{dt}\,x_1(t))\,k_{31}$$

$$+k_{21}\,k_{e2}^2\,k_{e1}\,x_1(t) + k_{e2}^2\,k_{e1}\,x_1(t)\,k_{31} + k_{41}\,k_{e1}\,(\frac{d}{dt}\,x_1(t))\,k_{31}$$

$$+k_{41}\,(\frac{d}{dt}\,x_1(t))\,k_{31}\,k_{e2} + k_{e2}^2\,k_{e1}\,x_1(t)\,k_{41} + (\frac{d}{dt}\,x_1(t))\,k_{e2}^3$$

$$+k_{21}\,k_{e2}^2\,(\frac{d}{dt}\,x_1(t)) + k_{e2}^2\,(\frac{d}{dt}\,x_1(t))\,k_{41} + k_{e2}^3\,k_{e1}\,x_1(t)$$

$$+k_{21}\,k_{41}\,k_{e1}\,x_1(t)\,k_{31} + k_{41}\,k_{e2}\,k_{e1}\,x_1(t)\,k_{31} + k_{e2}^2\,(\frac{d}{dt}\,x_1(t))\,k_{31}$$

$$+2\,k_{21}\,k_{e2}\,k_{e1}\,(\frac{d}{dt}\,x_1(t)) + 2\,k_{41}\,k_{e2}\,k_{e1}\,(\frac{d}{dt}\,x_1(t))$$

$$+2\,k_{e2}\,k_{e1}\,(\frac{d}{dt}\,x_1(t))\,k_{31} + k_{21}\,k_{41}\,k_{e2}\,k_{e1}\,x_1(t)$$

$$+k_{21}\,k_{e2}\,k_{e1}\,x_1(t)\,k_{31} + 3\,k_{e2}^2\,k_{e1}\,(\frac{d}{dt}\,x_1(t)) + k_{e1}\,(\frac{d^3}{dt^3}\,x_1(t))$$

$$+k_{41}\,(\frac{d^3}{dt^3}\,x_1(t)) + (\frac{d^3}{dt^3}\,x_1(t))\,k_{31} + k_{21}\,(\frac{d^3}{dt^3}\,x_1(t)) + 3\,k_{e2}\,(\frac{d^3}{dt^3}\,x_1(t))$$

$$+3\,k_{e2}^2\,(\frac{d^2}{dt^2}\,x_1(t)) + (\frac{d^4}{dt^4}\,x_1(t)) + k_{)}21\,k_{41}\,(\frac{d^2}{dt^2}\,x_1(t)) + k_{21}\,k_{e1}\,(\frac{d^2}{dt^2}\,x_1(t))$$

$$+k_{e1}\,(\frac{d^2}{dt^2}\,x_1(t))\,k_{31} + k_{41}\,(\frac{d^2}{dt^2}\,x_1(t))\,k_{31} + k_{41}\,k_{e1}\,(\frac{d^2}{dt^2}\,x_1(t))$$

$$+k_{21}\,(\frac{d^2}{dt^2}\,x_1(t))\,k_{31} + 3\,k_{e2}\,k_{e1}\,(\frac{d^2}{dt^2}\,x_1(t)) + 2\,k_{e2}\,(\frac{d^2}{dt^2}\,x_1(t))\,k_{41}$$

$$+2\,k_{e2}\,(\frac{d^2}{dt^2}\,x_1(t))\,k_{31} + 2\,k_{21}\,k_{e2}\,(\frac{d^2}{dt^2}\,x_1(t)))/(k_{21}\,k_{p2}\,k_{e2}^2$$

$$+k_{21}\,k_{31}\,k_{41}\,k_{p2} + k_{21}\,k_{41}\,k_{p2}\,k_{e2} + k_{21}\,k_{31}\,k_{p2}\,k_{e2}$$

$$+k_{21}\,k_{41}\,k_{p3}\,k_{31} + k_{21}\,k_{p4}\,k_{e2}\,k_{41} + k_{21}\,k_{p3}\,k_{e2}\,k_{31}$$

$$+k_{21}\,k_{p4}\,k_{41}\,k_{31} + k_{p3}\,k_{31}\,k_{e2}\,k_{41} + k_{p4}\,k_{41}\,k_{e2}\,k_{31} + k_{41}\,k_{e2}^2\,k_{p4}$$

$$+k_{31}\,k_{e2}^2\,k_{p3}) - x_5(t) = 0$$

$$C_{2,t} = (k_{p4}\,k_{41}^3\,k_{e2}^2\,(\frac{d}{dt}\,x_1(t)) - k_{41}^2\,k_{e2}\,k_{e1}\,x_1(t)\,k_{31}^2\,k_{p4} \tag{2}$$

$$-k_{21}\,k_{41}^2\,k_{e1}\,(\frac{d}{dt}\,x_1(t))\,k_{p4}\,k_{e2} - k_{21}\,k_{41}^2\,k_{e1}\,(\frac{d}{dt}\,x_1(t))\,k_{p4}\,k_{31}$$

$$-k_{21}\,k_{e2}^2\,(\frac{d}{dt}\,x_1(t))\,k_{41}^2\,k_{p4} - k_{41}^2\,k_{e1}\,x_1(t)\,k_{31}\,k_{e2}^2\,k_{p4}$$

$$+k_{21}\,k_{e2}\,(\frac{d}{dt}\,x_1(t))\,k_{31}^2\,k_{p4}\,k_{41} + k_{21}\,k_{e2}^2\,(\frac{d}{dt}\,x_1(t))\,k_{31}\,k_{p4}\,k_{41}$$

$$-k_{21}\,k_{e2}\,k_{e1}\,(\frac{d}{dt}\,x_1(t))\,k_{p4}\,k_{41}\,k_{31} + k_{41}^2\,k_{e2}^2\,k_{e1}\,(\frac{d}{dt}\,x_1(t))\,k_{p4}$$

$$-k_{41}\,k_{p4}\,k_{e2}^3\,k_{e1}\,(\frac{d}{dt}\,x_1(t)) - k_{21}^2\,k_{p4}\,k_{41}^2\,k_{e1}\,(\frac{d}{dt}\,x_1(t))$$

$$-k_{21}^2\,k_{p4}\,k_{41}\,k_{e2}\,k_{e1}\,(\frac{d}{dt}\,x_1(t)) - k_{21}^2\,k_{p2}\,k_{e2}^2\,k_{e1}\,(\frac{d}{dt}\,x_1(t))$$

1

$$-k_{21}^2\, k_{31}^2\, k_{p2}\, k_{e1}\, (\frac{d}{dt}\, x_1(t)) + k_{p4}\, k_{41}^3\, k_{e2}\, k_{e1}\, x_1(t)\, k_{31}$$

$$+k_{p4}\, k_{41}^3\, k_{e2}\, (\frac{d}{dt}\, x_1(t))\, k_{31} + k_{p4}\, k_{41}^3\, k_{e1}\, (\frac{d}{dt}\, x_1(t))\, k_{31}$$

$$-k_{21}^2\, k_{p3}\, k_{31}^2\, k_{e1}\, (\frac{d}{dt}\, x_1(t)) - k_{21}^2\, k_{p3}\, k_{31}\, k_{e2}\, k_{e1}\, (\frac{d}{dt}\, x_1(t))$$

$$-k_{31}\, k_{41}^2\, k_{e1}\, (\frac{d}{dt}\, x_1(t))\, k_{p4}\, k_{e2} - k_{31}\, k_{p3}\, k_{e2}^3\, k_{e1}\, (\frac{d}{dt}\, x_1(t))$$

$$-k_{31}^2\, k_{p4}\, k_{41}^2\, k_{e1}\, (\frac{d}{dt}\, x_1(t)) - k_{31}^2\, k_{p4}\, k_{41}\, k_{e2}\, k_{e1}\, (\frac{d}{dt}\, x_1(t))$$

$$-k_{31}^2\, k_{e2}^2\, k_{e1}\, (\frac{d}{dt}\, x_1(t))\, k_{p3} - k_{21}\, k_{41}^2\, (\frac{d}{dt}\, x_1(t))\, k_{31}^2\, k_{p4}$$

$$+k_{21}\, k_{e2}^2\, k_{e1}\, x_1(t)\, k_{p4}\, k_{41}\, k_{31} + k_{21}^2\, k_{e1}\, x_1(t)\, k_{31}^2\, k_{p4}\, k_{41}$$

$$-k_{21}\, k_{31}^2\, k_{e2}\, k_{p2}\, k_{e1}\, (\frac{d}{dt}\, x_1(t)) - k_{21}\, k_{p2}\, k_{e2}^3\, k_{e1}\, (\frac{d}{dt}\, x_1(t))$$

$$-k_{41}^2\, (\frac{d}{dt}\, x_1(t))\, k_{31}\, k_{e2}^2\, k_{p4} + k_{21}\, k_{e2}\, k_{e1}\, x_1(t)\, k_{31}^2\, k_{p4}\, k_{41}$$

$$+k_{21}^2\, (\frac{d}{dt}\, x_1(t))\, k_{31}^2\, k_{p4}\, k_{41} - k_{21}\, k_{41}^2\, k_{e2}^2\, k_{e1}\, x_1(t)\, k_{p4}$$

$$+k_{p4}\, k_{41}^3\, k_{e2}^2\, k_{e1}\, x_1(t) - k_{21}\, k_{41}^2\, k_{e1}\, x_1(t)\, k_{31}^2\, k_{p4}$$

$$+k_{21}\, k_{p4}\, k_{41}^3\, (\frac{d}{dt}\, x_1(t))\, k_{31} + k_{21}\, k_{p4}\, k_{41}^3\, k_{e2}\, (\frac{d}{dt}\, x_1(t))$$

$$+k_{21}\, k_{p4}\, k_{41}^3\, k_{e1}\, (\frac{d}{dt}\, x_1(t)) - k_{21}^2\, k_{p4}\, k_{41}^2\, k_{e2}\, k_{e1}\, x_1(t)$$

$$+k_{21}^2\, k_{p4}\, k_{41}\, k_{e2}\, (\frac{d}{dt}\, x_1(t))\, k_{31} - k_{21}^2\, k_{p4}\, k_{41}^2\, k_{e1}\, x_1(t)\, k_{31}$$

$$+k_{21}^2\, k_{p4}\, k_{41}\, k_{e2}\, k_{e1}\, x_1(t)\, k_{31} - k_{21}^2\, k_{p4}\, k_{41}^2\, (\frac{d}{dt}\, x_1(t))\, k_{31}$$

$$-k_{21}^2\, k_{p4}\, k_{41}^2\, k_{e2}\, (\frac{d}{dt}\, x_1(t)) - k_{e2}\, (\frac{d}{dt}\, x_1(t))\, k_{41}^2\, k_{31}^2\, k_{p4}$$

$$+k_{21}\, k_{p4}\, k_{41}^3\, k_{e1}\, x_1(t)\, k_{31} + k_{21}\, k_{p4}\, k_{41}^3\, k_{e2}\, k_{e1}\, x_1(t)$$

$$+k_{41}^2\, k_{e2}^2\, (\frac{d^2}{dt^2}\, x_1(t))\, k_{p4} - k_{41}\, k_{p4}\, k_{e2}^3\, (\frac{d^2}{dt^2}\, x_1(t))$$

$$+k_{p4}\, k_{41}^3\, k_{e1}\, (\frac{d^2}{dt^2}\, x_1(t)) + k_{p4}\, k_{41}^2\, k_{e1}\, (\frac{d^3}{dt^3}\, x_1(t))$$

$$+k_{p4}\, k_{41}^3\, (\frac{d^2}{dt^2}\, x_1(t))\, k_{31} - k_{41}\, (\frac{d^4}{dt^4}\, x_1(t))\, k_{p4}\, k_{e2}$$

$$-k_{21}^2\, k_{31}^2\, k_{p2}\, (\frac{d^2}{dt^2}\, x_1(t)) - k_{21}^2\, k_{p2}\, k_{e2}\, (\frac{d^3}{dt^3}\, x_1(t))$$

$$-k_{21}^2\, k_{p2}\, k_{e2}^2\, (\frac{d^2}{dt^2}\, x_1(t)) - k_{21}\, k_{31}\, k_{p2}\, (\frac{d^4}{dt^4}\, x_1(t))$$

$$-k_{21}\, k_{31}^2\, k_{p2}\, (\frac{d^3}{dt^3}\, x_1(t)) - k_{21}\, k_{p2}\, (\frac{d^4}{dt^4}\, x_1(t))\, k_{e2}$$

$$-k_{21}\, k_{p2}\, k_{e2}^3\, (\frac{d^2}{dt^2}\, x_1(t)) - k_{31}\, k_{41}\, k_{p4}\, (\frac{d^4}{dt^4}\, x_1(t))$$

$$-k_{31}\, k_{p3}\, k_{e2}^3\, (\frac{d^2}{dt^2}\, x_1(t)) - k_{31}\, (\frac{d^4}{dt^4}\, x_1(t))\, k_{p3}\, k_{e2}$$

$$-k_{31}^2\, (\frac{d^3}{dt^3}\, x_1(t))\, k_{p3}\, k_{e2} - k_{31}^2\, k_{e2}^2\, (\frac{d^2}{dt^2}\, x_1(t))\, k_{p3}$$

$$-k_{31}^2\, k_{p4}\, k_{41}^2\, (\frac{d^2}{dt^2}\, x_1(t)) - k_{31}^2\, k_{p4}\, k_{41}\, (\frac{d^3}{dt^3}\, x_1(t))$$

$$-k_{21}^2\, k_{p4}\, k_{41}^2\, (\frac{d^2}{dt^2}\, x_1(t)) - k_{21}^2\, k_{p4}\, k_{41}\, (\frac{d^3}{dt^3}\, x_1(t))$$

$$-k_{21}^2\, k_{p3}\, k_{31}\, (\frac{d^3}{dt^3}\, x_1(t)) - k_{21}^2\, k_{p3}\, k_{31}^2\, (\frac{d^2}{dt^2}\, x_1(t))$$

$$-k_{21}\, k_{41}\, k_{p4}\, (\frac{d^4}{dt^4}\, x_1(t)) - k_{21}\, k_{p3}\, k_{31}\, (\frac{d^4}{dt^4}\, x_1(t))$$

$$-k_{21}^2\, k_{p2}\, (\frac{d^3}{dt^3}\, x_1(t))\, k_{31} + k_{21}\, k_{p4}\, k_{41}^3\, (\frac{d^2}{dt^2}\, x_1(t))$$

$$-k_{21}\, k_{p3}\, k_{31}^2\, (\frac{d^3}{dt^3}\, x_1(t)) + 2\, k_{41}^3\, (\frac{d^2}{dt^2}\, x_1(t))\, k_{p4}\, k_{e2}$$

$$+2\, k_{41}^2\, (\frac{d^3}{dt^3}\, x_1(t))\, k_{p4}\, k_{e2} - 2\, k_{41}\, k_{p4}\, k_{e2}^2\, (\frac{d^3}{dt^3}\, x_1(t))$$

$$-2\, k_{21}\, k_{p2}\, k_{e2}^2\, (\frac{d^3}{dt^3}\, x_1(t)) - 2\, k_{31}\, k_{p3}\, k_{e2}^2\, (\frac{d^3}{dt^3}\, x_1(t))$$

$$-2\, k_{21}\, k_{41}^2\, k_{e1}\, x_1(t)\, k_{31}\, k_{p4}\, k_{e2} - 2\, k_{21}\, k_{e2}^2\, k_{e1}\, (\frac{d}{dt}\, x_1(t))\, k_{p4}\, k_{41}$$

$$-2\, k_{21}\, k_{e2}^2\, k_{e1}\, (\frac{d}{dt}\, x_1(t))\, k_{p3}\, k_{31} - 2\, k_{21}^2\, k_{31}\, k_{e2}\, k_{p2}\, k_{e1}\, (\frac{d}{dt}\, x_1(t))$$

$$+2\, k_{41}^3\, k_{e1}\, (\frac{d}{dt}\, x_1(t))\, k_{p4}\, k_{e2} - 2\, k_{31}\, k_{41}\, k_{e2}^2\, k_{e1}\, (\frac{d}{dt}\, x_1(t))\, k_{p4}$$

$$-2\, k_{21}\, k_{e1}\, (\frac{d}{dt}\, x_1(t))\, k_{31}^2\, k_{p3}\, k_{e2} - 2\, k_{21}\, k_{41}^2\, (\frac{d}{dt}\, x_1(t))\, k_{31}\, k_{p4}\, k_{e2}$$

$$-2\, k_{21}\, k_{31}\, k_{p2}\, k_{e2}^2\, k_{e1}\, (\frac{d}{dt}\, x_1(t)) - k_{21}\, k_{e1}\, (\frac{d^2}{dt^2}\, x_1(t))\, k_{p4}\, k_{41}\, k_{31}$$

$$-k_{21}\, k_{41}^2\, (\frac{d^2}{dt^2}\, x_1(t))\, k_{p4}\, k_{31} - k_{21}\, (\frac{d^3}{dt^3}\, x_1(t))\, k_{p4}\, k_{41}\, k_{31}$$

$$-k_{21}^2\, k_{p4}\, k_{41}\, k_{e1}\, (\frac{d^2}{dt^2}\, x_1(t)) - k_{21}^2\, k_{p4}\, k_{41}\, k_{e2}\, (\frac{d^2}{dt^2}\, x_1(t))$$

$$-k_{21}^2\, k_{p2}\, k_{e2}\, k_{e1}\, (\frac{d^2}{dt^2}\, x_1(t)) + k_{p4}\, k_{41}^3\, (\frac{d^3}{dt^3}\, x_1(t)) + k_{p4}\, k_{41}^2\, (\frac{d^4}{dt^4}\, x_1(t))$$

$$-k_{21}\, k_{p2}\, k_{e1}\, (\frac{d^3}{dt^3}\, x_1(t))\, k_{e2} - k_{21}\, k_{31}^2\, k_{p2}\, k_{e1}\, (\frac{d^2}{dt^2}\, x_1(t))$$

$$-k_{21}\, k_{31}^2\, k_{e2}\, k_{p2}\, (\frac{d^2}{dt^2}\, x_1(t)) - k_{21}^2\, k_{p3}\, k_{31}\, k_{e2}\, (\frac{d^2}{dt^2}\, x_1(t))$$

$$-k_{21}^2\, k_{p3}\, k_{31}\, k_{e1}\, (\frac{d^2}{dt^2}\, x_1(t)) - k_{21}\, k_{41}\, k_{p4}\, k_{e1}\, (\frac{d^3}{dt^3}\, x_1(t))$$

$$-k_{21}\, k_{41}^2\, (\frac{d^2}{dt^2}\, x_1(t))\, k_{p4}\, k_{e2} - k_{31}\, k_{41}^2\, (\frac{d^2}{dt^2}\, x_1(t))\, k_{p4}\, k_{e2}$$

$$-k_{31}\, k_{41}\, k_{p4}\, k_{e1}\, (\frac{d^3}{dt^3}\, x_1(t)) - k_{31}\, k_{e1}\, (\frac{d^3}{dt^3}\, x_1(t))\, k_{p3}\, k_{e2}$$

$$-k_{31}^2\, k_{p4}\, k_{41}\, k_{e1}\, (\frac{d^2}{dt^2}\, x_1(t)) - k_{31}^2\, k_{p4}\, k_{41}\, k_{e2}\, (\frac{d^2}{dt^2}\, x_1(t))$$

$$-k_{31}^2\, k_{e1}\, (\frac{d^2}{dt^2}\, x_1(t))\, k_{p3}\, k_{e2} - k_{41}\, k_{e1}\, (\frac{d^3}{dt^3}\, x_1(t))\, k_{p4}\, k_{e2}$$

$$-k_{21}\, k_{31}\, k_{p2}\, k_{e1}\, (\frac{d^3}{dt^3}\, x_1(t)) - k_{21}\, k_{e2}\, (\frac{d^2}{dt^2}\, x_1(t))\, k_{p4}\, k_{41}\, k_{31}$$

$$-k_{21}\, k_{p3}\, k_{31}\, k_{e1}\, (\frac{d^3}{dt^3}\, x_1(t)) - k_{21}^2\, k_{p2}\, k_{e1}\, (\frac{d^2}{dt^2}\, x_1(t))\, k_{31}$$

$$-k_{21}\,k_{p3}\,k_{31}^2\,k_{e1}\,(\frac{d^2}{dt^2}\,x_1(t)) - 3\,k_{21}\,(\frac{d^3}{dt^3}\,x_1(t))\,k_{p4}\,k_{e2}\,k_{41}$$

$$-3\,k_{21}\,(\frac{d^3}{dt^3}\,x_1(t))\,k_{p3}\,k_{e2}\,k_{31} - 2\,k_{21}\,k_{e2}^2\,(\frac{d^2}{dt^2}\,x_1(t))\,k_{p3}\,k_{31}$$

$$-2\,k_{21}\,k_{e2}^2\,(\frac{d^2}{dt^2}\,x_1(t))\,k_{p4}\,k_{41} - 3\,k_{21}\,k_{e1}\,(\frac{d^2}{dt^2}\,x_1(t))\,k_{p4}\,k_{e2}\,k_{41}$$

$$-3\,k_{21}\,k_{e1}\,(\frac{d^2}{dt^2}\,x_1(t))\,k_{p3}\,k_{e2}\,k_{31} - 2\,k_{21}^2\,k_{31}\,k_{e2}\,k_{p2}\,(\frac{d^2}{dt^2}\,x_1(t))$$

$$-2\,k_{21}\,k_{p2}\,k_{e2}^2\,k_{e1}\,(\frac{d^2}{dt^2}\,x_1(t)) - 2\,k_{21}\,k_{31}\,k_{p2}\,k_{e2}^2\,(\frac{d^2}{dt^2}\,x_1(t))$$

$$-3\,k_{21}\,k_{31}\,k_{p2}\,k_{e2}\,(\frac{d^3}{dt^3}\,x_1(t)) - 2\,k_{31}\,k_{41}\,k_{e2}^2\,(\frac{d^2}{dt^2}\,x_1(t))\,k_{p4}$$

$$-3\,k_{31}\,k_{41}\,(\frac{d^3}{dt^3}\,x_1(t))\,k_{p4}\,k_{e2} - 3\,k_{31}\,k_{41}\,k_{e1}\,(\frac{d^2}{dt^2}\,x_1(t))\,k_{p4}\,k_{e2}$$

$$-2\,k_{31}\,k_{p3}\,k_{e2}^2\,k_{e1}\,(\frac{d^2}{dt^2}\,x_1(t)) - 2\,k_{21}\,(\frac{d^2}{dt^2}\,x_1(t))\,k_{31}^2\,k_{p3}\,k_{e2}$$

$$+2\,k_{41}^2\,k_{e1}\,(\frac{d^2}{dt^2}\,x_1(t))\,k_{p4}\,k_{e2} - 2\,k_{41}\,k_{p4}\,k_{e2}^2\,k_{e1}\,(\frac{d^2}{dt^2}\,x_1(t))$$

$$-3\,k_{21}\,k_{31}\,k_{p2}\,k_{e2}\,k_{e1}\,(\frac{d^2}{dt^2}\,x_1(t)))/(k_{41}(k_{p3}\,k_{31}\,k_{41}^3\,k_{e2}$$

$$+k_{41}^2\,k_{p3}\,k_{31}\,k_{e2}^2 + k_{21}\,k_{41}^3\,k_{p3}\,k_{31} + k_{21}\,k_{p2}\,k_{41}^3\,k_{e2}$$

$$+k_{21}\,k_{p2}\,k_{41}^3\,k_{31} + k_{21}\,k_{p2}\,k_{41}^2\,k_{e2}^2 - k_{31}^2\,k_{41}^2\,k_{p4}\,k_{e2}$$

$$-k_{21}^2\,k_{41}\,k_{p2}\,k_{e2}^2 + k_{21}^2\,k_{31}\,k_{p2}\,k_{e2}^2 - k_{21}^2\,k_{41}^2\,k_{p2}\,k_{e2}$$

$$+k_{21}^2\,k_{31}^2\,k_{41}\,k_{p2} - k_{21}^2\,k_{31}\,k_{41}^2\,k_{p2} + k_{21}^2\,k_{31}^2\,k_{p2}\,k_{e2}$$

$$-k_{21}^2\,k_{31}^2\,k_{41}^2\,k_{p2} + k_{31}\,k_{p4}\,k_{41}^3\,k_{e2} - k_{31}^2\,k_{41}\,k_{e2}^2\,k_{p3}$$

$$-k_{31}^2\,k_{41}^2\,k_{e2}\,k_{p3} - k_{21}\,k_{41}^2\,k_{31}^2\,k_{p4} + k_{21}\,k_{e2}^2\,k_{p3}\,k_{31}^2$$

$$+k_{21}\,k_{p4}\,k_{41}^3\,k_{31} + k_{21}\,k_{p4}\,k_{41}^3\,k_{e2} - k_{31}\,k_{41}^2\,k_{e2}^2\,k_{p4}$$

$$-k_{21}\,k_{41}^2\,k_{31}^2\,k_{p3} - k_{21}^2\,k_{41}^2\,k_{p3}\,k_{31} - k_{21}\,k_{41}^2\,k_{e2}^2\,k_{p4}$$

$$-k_{21}^2\,k_{41}^2\,k_{31}\,k_{p4} + k_{21}^2\,k_{41}\,k_{31}^2\,k_{p3} + k_{21}^2\,k_{e2}\,k_{31}^2\,k_{p3}$$

$$-k_{21}^2\,k_{41}^2\,k_{e2}\,k_{p4} + k_{21}^2\,k_{p4}\,k_{41}\,k_{31}^2 + k_{p4}\,k_{41}^3\,k_{e2}^2$$

$$-k_{21}\,k_{31}^2\,k_{41}\,k_{p2}\,k_{e2} - k_{21}\,k_{31}\,k_{41}\,k_{p2}\,k_{e2}^2 + k_{21}\,k_{e2}\,k_{31}^2\,k_{p4}\,k_{41}$$

$$+k_{21}^2\,k_{e2}\,k_{31}\,k_{p4}\,k_{41} + k_{21}\,k_{e2}^2\,k_{p4}\,k_{41}\,k_{31} - k_{21}\,k_{41}\,k_{e2}^2\,k_{p3}\,k_{31}$$

$$-k_{p3}\,k_{21}^2\,k_{31}\,k_{41}\,k_{e2} - 2\,k_{21}\,k_{41}^2\,k_{31}\,k_{p4}\,k_{e2})) - x_4(t) = 0$$

$$C_{3,t} = (2\,k_{21}\,k_{41}^2\,k_{e1}\,(\frac{d}{dt}\,x_1(t))\,k_{p4}\,k_{e2} + k_{41}^2\,k_{e2}^2\,k_{e1}\,(\frac{d}{dt}\,x_1(t))\,k_{p4} \qquad (3)$$

$$+k_{41}\,k_{p4}\,k_{e2}^3\,k_{e1}\,(\frac{d}{dt}\,x_1(t)) + k_{21}^2\,k_{p4}\,k_{41}^2\,k_{e1}\,(\frac{d}{dt}\,x_1(t))$$

$$+k_{21}^2\,k_{p4}\,k_{41}\,k_{e2}\,k_{e1}\,(\frac{d}{dt}\,x_1(t)) + k_{21}^2\,k_{p2}\,k_{e2}^2\,k_{e1}\,(\frac{d}{dt}\,x_1(t))$$

$$+k_{21}^2\,k_{p3}\,k_{31}^2\,k_{e1}\,(\frac{d}{dt}\,x_1(t)) + k_{21}^2\,k_{p3}\,k_{31}\,k_{e2}\,k_{e1}\,(\frac{d}{dt}\,x_1(t))$$

$$+k_{31}\,k_{p3}\,k_{e2}^3\,k_{e1}\,(\frac{d}{dt}\,x_1(t)) - k_{31}^2\,k_{e2}^2\,k_{e1}\,(\frac{d}{dt}\,x_1(t))\,k_{p3}$$

$$+k_{21}\,k_{p2}\,k_{e2}^3\,k_{e1}\,(\frac{d}{dt}\,x_1(t)) + k_{41}^2\,k_{e2}^2\,(\frac{d^2}{dt^2}\,x_1(t))\,k_{p4}$$

$$+k_{41} \, k_{p4} \, k_{e2}^3 \, (\frac{d^2}{dt^2} \, x_1(t)) + k_{41} \, (\frac{d^4}{dt^4} \, x_1(t)) \, k_{p4} \, k_{e2}$$

$$+k_{21}^2 \, k_{p2} \, k_{e2} \, (\frac{d^3}{dt^3} \, x_1(t)) + k_{21}^2 \, k_{p2} \, k_{e2}^2 \, (\frac{d^2}{dt^2} \, x_1(t))$$

$$+k_{21} \, k_{p2} \, (\frac{d^4}{dt^4} \, x_1(t)) \, k_{e2} + k_{21} \, k_{p2} \, k_{e2}^3 \, (\frac{d^2}{dt^2} \, x_1(t))$$

$$+k_{31} \, k_{p3} \, k_{e2}^3 \, (\frac{d^2}{dt^2} \, x_1(t)) + k_{31} \, (\frac{d^4}{dt^4} \, x_1(t)) \, k_{p3} \, k_{e2}$$

$$-2 \, k_{31}^2 \, (\frac{d^3}{dt^3} \, x_1(t)) \, k_{p3} \, k_{e2} - k_{31}^2 \, k_{e2}^2 \, (\frac{d^2}{dt^2} \, x_1(t)) \, k_{p3}$$

$$+k_{21}^2 \, k_{p4} \, k_{41}^2 \, (\frac{d^2}{dt^2} \, x_1(t)) + k_{21}^2 \, k_{p4} \, k_{41} \, (\frac{d^3}{dt^3} \, x_1(t))$$

$$+k_{21}^2 \, k_{p3} \, k_{31} \, (\frac{d^3}{dt^3} \, x_1(t)) + k_{21}^2 \, k_{p3} \, k_{31}^2 \, (\frac{d^2}{dt^2} \, x_1(t))$$

$$+k_{21} \, k_{41} \, k_{p4} \, (\frac{d^4}{dt^4} \, x_1(t)) + k_{21} \, k_{p3} \, k_{31} \, (\frac{d^4}{dt^4} \, x_1(t))$$

$$+k_{41}^2 \, (\frac{d^3}{dt^3} \, x_1(t)) \, k_{p4} \, k_{e2} + 2 \, k_{41} \, k_{p4} \, k_{e2}^2 \, (\frac{d^3}{dt^3} \, x_1(t))$$

$$+2 \, k_{21} \, k_{p2} \, k_{e2}^2 \, (\frac{d^3}{dt^3} \, x_1(t)) + 2 \, k_{31} \, k_{p3} \, k_{e2}^2 \, (\frac{d^3}{dt^3} \, x_1(t))$$

$$-k_{e2}^2 \, k_{p3} \, k_{31}^3 \, (\frac{d}{dt} \, x_1(t)) + 2 \, k_{21} \, k_{e2}^2 \, k_{e1} \, (\frac{d}{dt} \, x_1(t)) \, k_{p4} \, k_{41}$$

$$+2 \, k_{21} \, k_{e2}^2 \, k_{e1} \, (\frac{d}{dt} \, x_1(t)) \, k_{p3} \, k_{31} + k_{21} \, k_{e1} \, (\frac{d}{dt} \, x_1(t)) \, k_{31}^2 \, k_{p3} \, k_{e2}$$

$$+k_{21}^2 \, k_{p4} \, k_{41} \, k_{e1} \, (\frac{d^2}{dt^2} \, x_1(t)) + k_{21}^2 \, k_{p4} \, k_{41} \, k_{e2} \, (\frac{d^2}{dt^2} \, x_1(t))$$

$$+k_{21}^2 \, k_{p2} \, k_{e2} \, k_{e1} \, (\frac{d^2}{dt^2} \, x_1(t)) + k_{21} \, k_{p2} \, k_{e1} \, (\frac{d^3}{dt^3} \, x_1(t)) \, k_{e2}$$

$$+k_{21}^2 \, k_{p3} \, k_{31} \, k_{e2} \, (\frac{d^2}{dt^2} \, x_1(t)) + k_{21}^2 \, k_{p3} \, k_{31} \, k_{e1} \, (\frac{d^2}{dt^2} \, x_1(t))$$

$$+k_{21} \, k_{41} \, k_{p4} \, k_{e1} \, (\frac{d^3}{dt^3} \, x_1(t)) + 2 \, k_{21} \, k_{41}^2 \, (\frac{d^2}{dt^2} \, x_1(t)) \, k_{p4} \, k_{e2}$$

$$+k_{31} \, k_{e1} \, (\frac{d^3}{dt^3} \, x_1(t)) \, k_{p3} \, k_{e2} - 2 \, k_{31}^2 \, k_{e1} \, (\frac{d^2}{dt^2} \, x_1(t)) \, k_{p3} \, k_{e2}$$

$$+k_{41} \, k_{e1} \, (\frac{d^3}{dt^3} \, x_1(t)) \, k_{p4} \, k_{e2} + k_{21} \, k_{p3} \, k_{31} \, k_{e1} \, (\frac{d^3}{dt^3} \, x_1(t))$$

$$+3 \, k_{21} \, (\frac{d^3}{dt^3} \, x_1(t)) \, k_{p4} \, k_{e2} \, k_{41} + 3 \, k_{21} \, (\frac{d^3}{dt^3} \, x_1(t)) \, k_{p3} \, k_{e2} \, k_{31}$$

$$+2 \, k_{21} \, k_{e2}^2 \, (\frac{d^2}{dt^2} \, x_1(t)) \, k_{p3} \, k_{31} + 2 \, k_{21} \, k_{e2}^2 \, (\frac{d^2}{dt^2} \, x_1(t)) \, k_{p4} \, k_{41}$$

$$+3 \, k_{21} \, k_{e1} \, (\frac{d^2}{dt^2} \, x_1(t)) \, k_{p4} \, k_{e2} \, k_{41} + 3 \, k_{21} \, k_{e1} \, (\frac{d^2}{dt^2} \, x_1(t)) \, k_{p3} \, k_{e2} \, k_{31}$$

$$+2 \, k_{21} \, k_{p2} \, k_{e2}^2 \, k_{e1} \, (\frac{d^2}{dt^2} \, x_1(t)) + 2 \, k_{31} \, k_{p3} \, k_{e2}^2 \, k_{e1} \, (\frac{d^2}{dt^2} \, x_1(t))$$

$$+k_{21} \, (\frac{d^2}{dt^2} \, x_1(t)) \, k_{31}^2 \, k_{p3} \, k_{e2} + k_{41}^2 \, k_{e1} \, (\frac{d^2}{dt^2} \, x_1(t)) \, k_{p4} \, k_{e2}$$

$$+2 \, k_{41} \, k_{p4} \, k_{e2}^2 \, k_{e1} \, (\frac{d^2}{dt^2} \, x_1(t)) + k_{41}^2 \, k_{e2} \, k_{e1} \, x_1(t) \, k_{31}^2 \, k_{p3}$$

$$-k_{21} \, k_{e2}^2 \, (\frac{d}{dt} \, x_1(t)) \, k_{41} \, k_{p3} \, k_{31} + k_{21} \, k_{e2}^2 \, (\frac{d}{dt} \, x_1(t)) \, k_{31}^2 \, k_{p3}$$

$$+k_{41}\,k_{e1}\,x_1(t)\,k_{31}^2\,k_{e2}^2\,k_{p3} + k_{21}^2\,k_{41}^2\,k_{p2}\,k_{e1}\,(\frac{d}{dt}\,x_1(t))$$

$$-k_{21}\,k_{p3}\,k_{31}^3\,k_{e2}\,k_{e1}\,x_1(t) - k_{21}\,k_{p3}\,k_{31}^3\,k_{41}\,k_{e1}\,x_1(t)$$

$$+k_{21}^2\,k_{p3}\,k_{31}^2\,k_{e2}\,(\frac{d}{dt}\,x_1(t)) + k_{21}^2\,k_{p3}\,k_{31}^2\,k_{41}\,(\frac{d}{dt}\,x_1(t))$$

$$+k_{21}^2\,k_{p3}\,k_{31}^2\,k_{41}\,k_{e1}\,x_1(t) - k_{21}^2\,k_{p3}\,k_{31}\,k_{e2}\,(\frac{d}{dt}\,x_1(t))\,k_{41}$$

$$-k_{21}^2\,k_{41}^2\,k_{e1}\,x_1(t)\,k_{p3}\,k_{31} - k_{21}^2\,k_{41}^2\,(\frac{d}{dt}\,x_1(t))\,k_{p3}\,k_{31}$$

$$+k_{31}\,k_{41}^2\,k_{e1}\,(\frac{d}{dt}\,x_1(t))\,k_{p3}\,k_{e2} - k_{21}\,k_{e2}\,(\frac{d}{dt}\,x_1(t))\,k_{41}^2\,k_{p3}\,k_{31}$$

$$+k_{21}\,k_{41}^2\,k_{e1}\,x_1(t)\,k_{31}^2\,k_{p3} + k_{21}\,k_{41}\,k_{e1}\,(\frac{d}{dt}\,x_1(t))\,k_{p3}\,k_{e2}\,k_{31}$$

$$+k_{21}^2\,k_{p3}\,k_{31}^2\,k_{e2}\,k_{e1}\,x_1(t) - k_{21}^2\,k_{p3}\,k_{31}\,k_{41}\,k_{e2}\,k_{e1}\,x_1(t)$$

$$-k_{21}\,k_{p3}\,k_{31}^3\,k_{41}\,(\frac{d}{dt}\,x_1(t)) - k_{21}\,k_{p3}\,k_{31}^3\,k_{e1}\,(\frac{d}{dt}\,x_1(t))$$

$$+k_{21}\,k_{e1}\,(\frac{d}{dt}\,x_1(t))\,k_{31}^2\,k_{41}\,k_{p3} + k_{31}^2\,k_{41}\,k_{e1}\,(\frac{d}{dt}\,x_1(t))\,k_{p3}\,k_{e2}$$

$$+k_{31}^2\,k_{41}^2\,k_{p3}\,k_{e1}\,(\frac{d}{dt}\,x_1(t)) + k_{21}\,k_{41}^2\,(\frac{d}{dt}\,x_1(t))\,k_{31}^2\,k_{p3}$$

$$-k_{21}\,k_{e2}^2\,k_{e1}\,x_1(t)\,k_{41}\,k_{p3}\,k_{31} + k_{21}\,k_{41}^2\,k_{e2}\,k_{p2}\,k_{e1}\,(\frac{d}{dt}\,x_1(t))$$

$$-k_{21}\,k_{p3}\,k_{31}^3\,k_{e2}\,(\frac{d}{dt}\,x_1(t)) - k_{p3}\,k_{31}^3\,k_{41}\,k_{e2}\,(\frac{d}{dt}\,x_1(t))$$

$$+k_{21}\,k_{e2}^2\,k_{e1}\,x_1(t)\,k_{31}^2\,k_{p3} - k_{21}\,k_{41}^2\,k_{e2}\,k_{e1}\,x_1(t)\,k_{p3}\,k_{31}$$

$$+k_{41}\,(\frac{d}{dt}\,x_1(t))\,k_{31}^2\,k_{e2}^2\,k_{p3} + k_{e2}\,(\frac{d}{dt}\,x_1(t))\,k_{41}^2\,k_{31}^2\,k_{p3}$$

$$-k_{e2}^2\,k_{p3}\,k_{31}^3\,k_{e1}\,x_1(t) - k_{p3}\,k_{31}^3\,k_{41}\,k_{e2}\,k_{e1}\,x_1(t)$$

$$-k_{p3}\,k_{31}^3\,k_{41}\,k_{e1}\,(\frac{d}{dt}\,x_1(t)) - k_{p3}\,k_{31}^2\,k_{e1}\,(\frac{d^3}{dt^3}\,x_1(t))$$

$$-k_{p3}\,k_{31}^3\,k_{e1}\,(\frac{d^2}{dt^2}\,x_1(t)) + k_{21}^2\,k_{41}^2\,k_{p2}\,(\frac{d^2}{dt^2}\,x_1(t))$$

$$+k_{21}\,k_{41}^2\,k_{p2}\,(\frac{d^3}{dt^3}\,x_1(t)) + k_{21}\,k_{41}\,k_{p2}\,(\frac{d^4}{dt^4}\,x_1(t))$$

$$+k_{31}\,k_{41}^2\,k_{p3}\,(\frac{d^3}{dt^3}\,x_1(t)) + k_{31}\,k_{41}\,k_{p3}\,(\frac{d^4}{dt^4}\,x_1(t))$$

$$+k_{31}^2\,k_{41}^2\,k_{p3}\,(\frac{d^2}{dt^2}\,x_1(t)) + k_{21}^2\,k_{p2}\,(\frac{d^3}{dt^3}\,x_1(t))\,k_{41}$$

$$+k_{21}\,k_{41}^2\,k_{p4}\,(\frac{d^3}{dt^3}\,x_1(t)) - k_{21}\,k_{p3}\,k_{31}^3\,(\frac{d^2}{dt^2}\,x_1(t))$$

$$-k_{p3}\,k_{31}^3\,k_{41}\,(\frac{d^2}{dt^2}\,x_1(t)) - 2\,(\frac{d^2}{dt^2}\,x_1(t))\,k_{31}^3\,k_{p3}\,k_{e2}$$

$$+2\,k_{21}\,k_{41}\,k_{e1}\,x_1(t)\,k_{31}^2\,k_{p3}\,k_{e2} + 2\,k_{21}^2\,k_{41}\,k_{e2}\,k_{p2}\,k_{e1}\,(\frac{d}{dt}\,x_1(t))$$

$$+2\,k_{31}\,k_{41}\,k_{e2}^2\,k_{e1}\,(\frac{d}{dt}\,x_1(t))\,k_{p3} + 2\,k_{21}\,k_{41}\,(\frac{d}{dt}\,x_1(t))\,k_{31}^2\,k_{p3}\,k_{e2}$$

$$+2\,k_{21}\,k_{41}\,k_{p2}\,k_{e2}^2\,k_{e1}\,(\frac{d}{dt}\,x_1(t)) - 2\,k_{e1}\,(\frac{d}{dt}\,x_1(t))\,k_{31}^3\,k_{p3}\,k_{e2}$$

$$-k_{p3}\,k_{31}^2\,(\frac{d^4}{dt^4}\,x_1(t)) - k_{p3}\,k_{31}^3\,(\frac{d^3}{dt^3}\,x_1(t)) + k_{21}\,k_{41}^2\,k_{p2}\,k_{e1}\,(\frac{d^2}{dt^2}\,x_1(t))$$

$$+k_{21} \left(\frac{d^3}{dt^3} x_1(t)\right) k_{41} k_{p3} k_{31} + k_{21} k_{41}^2 k_{p4} k_{e1} \left(\frac{d^2}{dt^2} x_1(t)\right)$$

$$+k_{31} k_{41}^2 \left(\frac{d^2}{dt^2} x_1(t)\right) k_{p3} k_{e2} + k_{31} k_{41}^2 k_{p3} k_{e1} \left(\frac{d^2}{dt^2} x_1(t)\right)$$

$$+k_{31} k_{41} k_{p3} k_{e1} \left(\frac{d^3}{dt^3} x_1(t)\right) + k_{21} k_{e2} \left(\frac{d^2}{dt^2} x_1(t)\right) k_{41} k_{p3} k_{31}$$

$$+k_{21} k_{e1} \left(\frac{d^2}{dt^2} x_1(t)\right) k_{41} k_{p3} k_{31} + k_{21}^2 k_{p2} k_{e1} \left(\frac{d^2}{dt^2} x_1(t)\right) k_{41}$$

$$+k_{31}^2 k_{41} \left(\frac{d^2}{dt^2} x_1(t)\right) k_{p3} k_{e2} + k_{21} \left(\frac{d^2}{dt^2} x_1(t)\right) k_{31}^2 k_{41} k_{p3}$$

$$+k_{21} k_{41}^2 k_{e2} k_{p2} \left(\frac{d^2}{dt^2} x_1(t)\right) + k_{21} k_{41} k_{p2} k_{e1} \left(\frac{d^3}{dt^3} x_1(t)\right)$$

$$+2 k_{21}^2 k_{41} k_{e2} k_{p2} \left(\frac{d^2}{dt^2} x_1(t)\right) + 2 k_{31} k_{41} k_{e2}^2 \left(\frac{d^2}{dt^2} x_1(t)\right) k_{p3}$$

$$+3 k_{31} k_{41} k_{e1} \left(\frac{d^2}{dt^2} x_1(t)\right) k_{p3} k_{e2} + 3 k_{31} k_{41} \left(\frac{d^3}{dt^3} x_1(t)\right) k_{p3} k_{e2}$$

$$+3 k_{21} k_{41} k_{p2} k_{e2} \left(\frac{d^3}{dt^3} x_1(t)\right) + 3 k_{21} k_{41} k_{p2} k_{e2} k_{e1} \left(\frac{d^2}{dt^2} x_1(t)\right)$$

$$+2 k_{21} k_{41} k_{p2} k_{e2}^2 \left(\frac{d^2}{dt^2} x_1(t)\right))/(k_{31}(k_{31}^2 k_{41}^2 k_{p4} k_{e2}$$

$$-k_{21}^2 k_{41} k_{p2} k_{e2}^2 + k_{21}^2 k_{31} k_{p2} k_{e2}^2 - k_{21}^2 k_{41}^2 k_{p2} k_{e2}$$

$$+k_{21}^2 k_{31}^2 k_{41} k_{p2} - k_{21}^2 k_{31} k_{41}^2 k_{p2} + k_{21}^2 k_{31}^2 k_{p2} k_{e2}$$

$$+k_{21} k_{31}^2 k_{41}^2 k_{p2} + k_{31}^2 k_{41} k_{e2}^2 k_{p3} + k_{31}^2 k_{41}^2 k_{e2} k_{p3}$$

$$+k_{21} k_{41}^2 k_{31}^2 k_{p4} + k_{21} k_{e2}^2 k_{p3} k_{31}^2 + k_{31} k_{41}^2 k_{e2}^2 k_{p4}$$

$$+k_{21} k_{41}^2 k_{31}^2 k_{p3} - k_{21}^2 k_{41}^2 k_{p3} k_{31} - k_{21} k_{41}^2 k_{e2}^2 k_{p4}$$

$$-k_{21}^2 k_{41}^2 k_{31} k_{p4} + k_{21}^2 k_{41} k_{31}^2 k_{p3} + k_{21}^2 k_{e2} k_{31}^2 k_{p3}$$

$$-k_{21}^2 k_{41}^2 k_{e2} k_{p4} + k_{21}^2 k_{p4} k_{41} k_{31}^2 - k_{p3} k_{31}^3 k_{e2}^2$$

$$+k_{21} k_{31} k_{41} k_{p2} k_{e2}^2 + k_{21}^2 k_{e2} k_{31} k_{p4} k_{41} + k_{21} k_{e2}^2 k_{p4} k_{41} k_{31}$$

$$-k_{21} k_{41} k_{e2}^2 k_{p3} k_{31} - k_{p3} k_{21}^2 k_{31} k_{41} k_{e2} + k_{21} k_{31} k_{41}^2 k_{p2} k_{e2}$$

$$-k_{21} k_{p2} k_{31}^3 k_{41} - k_{21} k_{p2} k_{31}^3 k_{e2} - k_{21} k_{p3} k_{31}^3 k_{41}$$

$$-k_{21} k_{p3} k_{31}^3 k_{e2} - k_{21} k_{31}^3 k_{p4} k_{41} - k_{21} k_{31}^2 k_{e2}^2 k_{p2}$$

$$-k_{p3} k_{31}^3 k_{41} k_{e2} - k_{31}^3 k_{p4} k_{41} k_{e2} - k_{31}^2 k_{p4} k_{e2}^2 k_{41}$$

$$-k_{21} k_{41}^2 k_{e2} k_{p3} k_{31} + 2 k_{p3} k_{21} k_{31}^2 k_{41} k_{e2})) - x_3(t) = 0$$

$$C_{4,t} = (-k_{41}^2 k_{e2}^2 k_{e1} \left(\frac{d}{dt} x_1(t)\right) k_{p4} - k_{41} k_{p4} k_{e2}^3 k_{e1} \left(\frac{d}{dt} x_1(t)\right) \tag{4}$$

$$+k_{21}^2 k_{p2} k_{e2}^2 k_{e1} \left(\frac{d}{dt} x_1(t)\right) - k_{21}^2 k_{31}^2 k_{p2} k_{e1} \left(\frac{d}{dt} x_1(t)\right)$$

$$-2 k_{31} k_{41}^2 k_{e1} \left(\frac{d}{dt} x_1(t)\right) k_{p4} k_{e2} - k_{31} k_{p3} k_{e2}^3 k_{e1} \left(\frac{d}{dt} x_1(t)\right)$$

$$-k_{31}^2 k_{p4} k_{41}^2 k_{e1} \left(\frac{d}{dt} x_1(t)\right) - k_{31}^2 k_{p4} k_{41} k_{e2} k_{e1} \left(\frac{d}{dt} x_1(t)\right)$$

$$-k_{31}^2 k_{e2}^2 k_{e1} \left(\frac{d}{dt} x_1(t)\right) k_{p3} - k_{21} k_{31}^2 k_{e2} k_{p2} k_{e1} \left(\frac{d}{dt} x_1(t)\right)$$

$$-k_{21} k_{p2} k_{e2}^3 k_{e1} \left(\frac{d}{dt} x_1(t)\right) - k_{41}^2 k_{e2}^2 \left(\frac{d^2}{dt^2} x_1(t)\right) k_{p4}$$

$$-k_{41}\,k_{p4}\,k_{e2}^3\,(\frac{d^2}{dt^2}\,x_1(t)) - k_{41}\,(\frac{d^4}{dt^4}\,x_1(t))\,k_{p4}\,k_{e2}$$

$$-k_{21}^2\,k_{31}^2\,k_{p2}\,(\frac{d^2}{dt^2}\,x_1(t)) + 2\,k_{21}^2\,k_{p2}\,k_{e2}\,(\frac{d^3}{dt^3}\,x_1(t))$$

$$+k_{21}^2\,k_{p2}\,k_{e2}^2\,(\frac{d^2}{dt^2}\,x_1(t)) - k_{21}\,k_{31}\,k_{p2}\,(\frac{d^4}{dt^4}\,x_1(t))$$

$$-k_{21}\,k_{31}^2\,k_{p2}\,(\frac{d^3}{dt^3}\,x_1(t)) - k_{21}\,k_{p2}\,(\frac{d^4}{dt^4}\,x_1(t))\,k_{e2}$$

$$-k_{21}\,k_{p2}\,k_{e2}^3\,(\frac{d^2}{dt^2}\,x_1(t)) - k_{31}\,k_{41}\,k_{p4}\,(\frac{d^4}{dt^4}\,x_1(t))$$

$$-k_{31}\,k_{p3}\,k_{e2}^3\,(\frac{d^2}{dt^2}\,x_1(t)) - k_{31}\,(\frac{d^4}{dt^4}\,x_1(t))\,k_{p3}\,k_{e2}$$

$$-k_{31}^2\,(\frac{d^3}{dt^3}\,x_1(t))\,k_{p3}\,k_{e2} - k_{31}^2\,k_{e2}^2\,(\frac{d^2}{dt^2}\,x_1(t))\,k_{p3}$$

$$-k_{31}^2\,k_{p4}\,k_{41}^2\,(\frac{d^2}{dt^2}\,x_1(t)) - k_{31}^2\,k_{p4}\,k_{41}\,(\frac{d^3}{dt^3}\,x_1(t))$$

$$-k_{41}^2\,(\frac{d^3}{dt^3}\,x_1(t))\,k_{p4}\,k_{e2} - 2\,k_{41}\,k_{p4}\,k_{e2}^2\,(\frac{d^3}{dt^3}\,x_1(t))$$

$$-2\,k_{21}\,k_{p2}\,k_{e2}^2\,(\frac{d^3}{dt^3}\,x_1(t)) - 2\,k_{31}\,k_{p3}\,k_{e2}^2\,(\frac{d^3}{dt^3}\,x_1(t))$$

$$-k_{21}^2\,k_{31}\,k_{e2}\,k_{p2}\,k_{e1}\,(\frac{d}{dt}\,x_1(t)) - 2\,k_{31}\,k_{41}\,k_{e2}^2\,k_{e1}\,(\frac{d}{dt}\,x_1(t))\,k_{p4}$$

$$-2\,k_{21}\,k_{31}\,k_{p2}\,k_{e2}^2\,k_{e1}\,(\frac{d}{dt}\,x_1(t)) + 2\,k_{21}^2\,k_{p2}\,k_{e2}\,k_{e1}\,(\frac{d^2}{dt^2}\,x_1(t))$$

$$-k_{21}\,k_{p2}\,k_{e1}\,(\frac{d^3}{dt^3}\,x_1(t))\,k_{e2} - k_{21}\,k_{31}^2\,k_{p2}\,k_{e1}\,(\frac{d^2}{dt^2}\,x_1(t))$$

$$-k_{21}\,k_{31}^2\,k_{e2}\,k_{p2}\,(\frac{d^2}{dt^2}\,x_1(t)) - 2\,k_{31}\,k_{41}^2\,(\frac{d^2}{dt^2}\,x_1(t))\,k_{p4}\,k_{e2}$$

$$-k_{31}\,k_{41}\,k_{p4}\,k_{e1}\,(\frac{d^3}{dt^3}\,x_1(t)) - k_{31}\,k_{e1}\,(\frac{d^3}{dt^3}\,x_1(t))\,k_{p3}\,k_{e2}$$

$$-k_{31}^2\,k_{p4}\,k_{41}\,k_{e1}\,(\frac{d^2}{dt^2}\,x_1(t)) - k_{31}^2\,k_{p4}\,k_{41}\,k_{e2}\,(\frac{d^2}{dt^2}\,x_1(t))$$

$$-k_{31}^2\,k_{e1}\,(\frac{d^2}{dt^2}\,x_1(t))\,k_{p3}\,k_{e2} - k_{41}\,k_{e1}\,(\frac{d^3}{dt^3}\,x_1(t))\,k_{p4}\,k_{e2}$$

$$-k_{21}\,k_{31}\,k_{p2}\,k_{e1}\,(\frac{d^3}{dt^3}\,x_1(t)) - k_{21}^2\,k_{31}\,k_{e2}\,k_{p2}\,(\frac{d^2}{dt^2}\,x_1(t))$$

$$-2\,k_{21}\,k_{p2}\,k_{e2}^2\,k_{e1}\,(\frac{d^2}{dt^2}\,x_1(t)) - 2\,k_{21}\,k_{31}\,k_{p2}\,k_{e2}^2\,(\frac{d^2}{dt^2}\,x_1(t))$$

$$-3\,k_{21}\,k_{31}\,k_{p2}\,k_{e2}\,(\frac{d^3}{dt^3}\,x_1(t)) - 2\,k_{31}\,k_{41}\,k_{e2}^2\,(\frac{d^2}{dt^2}\,x_1(t))\,k_{p4}$$

$$-3\,k_{31}\,k_{41}\,(\frac{d^3}{dt^3}\,x_1(t))\,k_{p4}\,k_{e2} - 3\,k_{31}\,k_{41}\,k_{e1}\,(\frac{d^2}{dt^2}\,x_1(t))\,k_{p4}\,k_{e2}$$

$$-2\,k_{31}\,k_{p3}\,k_{e2}^2\,k_{e1}\,(\frac{d^2}{dt^2}\,x_1(t)) - k_{41}^2\,k_{e1}\,(\frac{d^2}{dt^2}\,x_1(t))\,k_{p4}\,k_{e2}$$

$$-2\,k_{41}\,k_{p4}\,k_{e2}^2\,k_{e1}\,(\frac{d^2}{dt^2}\,x_1(t)) - 3\,k_{21}\,k_{31}\,k_{p2}\,k_{e2}\,k_{e1}\,(\frac{d^2}{dt^2}\,x_1(t))$$

$$-k_{21}^2\,k_{41}^2\,k_{p2}\,k_{e1}\,(\frac{d}{dt}\,x_1(t)) - k_{31}\,k_{41}^2\,k_{e1}\,(\frac{d}{dt}\,x_1(t))\,k_{p3}\,k_{e2}$$

$$-2\,k_{31}^2\,k_{41}\,k_{e1}\,(\frac{d}{dt}\,x_1(t))\,k_{p3}\,k_{e2} - k_{31}^2\,k_{41}^2\,k_{p3}\,k_{e1}\,(\frac{d}{dt}\,x_1(t))$$

$$-k_{21}\,k_{41}^2\,k_{e2}\,k_{p2}\,k_{e1}\,(\frac{d}{dt}\,x_1(t)) - k_{21}^2\,k_{41}^2\,k_{p2}\,(\frac{d^2}{dt^2}\,x_1(t))$$

$$-k_{21}\,k_{41}^2\,k_{p2}\,(\frac{d^3}{dt^3}\,x_1(t)) - k_{21}\,k_{41}\,k_{p2}\,(\frac{d^4}{dt^4}\,x_1(t))$$

$$-k_{31}\,k_{41}^2\,k_{p3}\,(\frac{d^3}{dt^3}\,x_1(t)) - k_{31}\,k_{41}\,k_{p3}\,(\frac{d^4}{dt^4}\,x_1(t))$$

$$-k_{31}^2\,k_{41}^2\,k_{p3}\,(\frac{d^2}{dt^2}\,x_1(t)) + k_{21}^3\,k_{e2}^2\,k_{p2}\,(\frac{d}{dt}\,x_1(t))$$

$$-k_{21}^2\,k_{41}\,k_{e2}\,k_{p2}\,k_{e1}\,(\frac{d}{dt}\,x_1(t)) - 2\,k_{31}\,k_{41}\,k_{e2}^2\,k_{e1}\,(\frac{d}{dt}\,x_1(t))\,k_{p3}$$

$$-2\,k_{21}\,k_{41}\,k_{p2}\,k_{e2}^2\,k_{e1}\,(\frac{d}{dt}\,x_1(t)) - k_{21}\,k_{41}^2\,k_{p2}\,k_{e1}\,(\frac{d^2}{dt^2}\,x_1(t))$$

$$-k_{31}\,k_{41}^2\,(\frac{d^2}{dt^2}\,x_1(t))\,k_{p3}\,k_{e2} - k_{31}\,k_{41}^2\,k_{p3}\,k_{e1}\,(\frac{d^2}{dt^2}\,x_1(t))$$

$$-k_{31}\,k_{41}\,k_{p3}\,k_{e1}\,(\frac{d^3}{dt^3}\,x_1(t)) - 2\,k_{31}^2\,k_{41}\,(\frac{d^2}{dt^2}\,x_1(t))\,k_{p3}\,k_{e2}$$

$$-k_{21}\,k_{41}^2\,k_{e2}\,k_{p2}\,(\frac{d^2}{dt^2}\,x_1(t)) - k_{21}\,k_{41}\,k_{p2}\,k_{e1}\,(\frac{d^3}{dt^3}\,x_1(t))$$

$$-k_{21}^2\,k_{41}\,k_{e2}\,k_{p2}\,(\frac{d^2}{dt^2}\,x_1(t)) - 2\,k_{31}\,k_{41}\,k_{e2}^2\,(\frac{d^2}{dt^2}\,x_1(t))\,k_{p3}$$

$$-3\,k_{31}\,k_{41}\,k_{e1}\,(\frac{d^2}{dt^2}\,x_1(t))\,k_{p3}\,k_{e2} - 3\,k_{31}\,k_{41}\,(\frac{d^3}{dt^3}\,x_1(t))\,k_{p3}\,k_{e2}$$

$$-3\,k_{21}\,k_{41}\,k_{p2}\,k_{e2}\,(\frac{d^3}{dt^3}\,x_1(t)) - 3\,k_{21}\,k_{41}\,k_{p2}\,k_{e2}\,k_{e1}\,(\frac{d^2}{dt^2}\,x_1(t))$$

$$-2\,k_{21}\,k_{41}\,k_{p2}\,k_{e2}^2\,(\frac{d^2}{dt^2}\,x_1(t)) + k_{21}^3\,k_{p2}\,k_{e1}\,(\frac{d}{dt}\,x_1(t))\,k_{31}$$

$$+k_{21}^3\,k_{p2}\,k_{41}\,(\frac{d}{dt}\,x_1(t))\,k_{31} + k_{21}^3\,k_{e2}\,k_{p2}\,(\frac{d}{dt}\,x_1(t))\,k_{41}$$

$$+k_{21}^3\,k_{p2}\,k_{41}\,k_{e1}\,(\frac{d}{dt}\,x_1(t)) + k_{21}^3\,k_{41}\,k_{e2}\,k_{p2}\,k_{e1}\,x_1(t)$$

$$+k_{21}^3\,k_{p2}\,k_{41}\,k_{e1}\,x_1(t)\,k_{31} + k_{21}^3\,k_{e2}^2\,k_{p2}\,k_{e1}\,x_1(t)$$

$$+k_{21}^3\,k_{e2}\,k_{p2}\,(\frac{d}{dt}\,x_1(t))\,k_{31} + k_{21}^3\,k_{e2}\,k_{p2}\,k_{e1}\,x_1(t)\,k_{31}$$

$$-k_{21}^2\,k_{41}\,k_{e2}^2\,k_{p2}\,k_{e1}\,x_1(t) - k_{21}^2\,k_{41}^2\,k_{p2}\,k_{e2}\,k_{e1}\,x_1(t)$$

$$+k_{21}^3\,k_{p2}\,k_{e1}\,(\frac{d^2}{dt^2}\,x_1(t)) + k_{21}^3\,k_{p2}\,k_{41}\,(\frac{d^2}{dt^2}\,x_1(t))$$

$$+k_{21}^3\,k_{p2}\,(\frac{d^2}{dt^2}\,x_1(t))\,k_{31} - k_{21}^2\,k_{31}\,k_{p2}\,k_{41}\,k_{e1}\,(\frac{d}{dt}\,x_1(t))$$

$$-k_{21}^2\,k_{41}^2\,k_{p2}\,k_{e2}\,(\frac{d}{dt}\,x_1(t)) - k_{21}^2\,k_{41}\,k_{e2}^2\,k_{p2}\,(\frac{d}{dt}\,x_1(t))$$

$$-k_{21}^2\,k_{31}\,k_{e2}^2\,k_{p2}\,k_{e1}\,x_1(t) - k_{21}^2\,k_{31}\,k_{41}^2\,k_{p2}\,k_{e1}\,x_1(t)$$

$$-k_{21}^2\,k_{31}^2\,k_{41}\,k_{p2}\,k_{e1}\,x_1(t) - k_{21}^2\,k_{31}^2\,k_{p2}\,k_{e2}\,k_{e1}\,x_1(t)$$

$$-k_{21}^2\,k_{31}\,k_{41}^2\,k_{p2}\,(\frac{d}{dt}\,x_1(t)) - k_{21}^2\,k_{31}\,k_{e2}^2\,k_{p2}\,(\frac{d}{dt}\,x_1(t))$$

$$-k_{21}^2\,k_{31}^2\,k_{41}\,k_{p2}\,(\frac{d}{dt}\,x_1(t)) - k_{21}^2\,k_{31}^2\,k_{p2}\,k_{e2}\,(\frac{d}{dt}\,x_1(t))$$

$$-k_{21}\,k_{31}\,k_{41}\,k_{e2}\,k_{p2}\,k_{e1}\,(\frac{d}{dt}\,x_1(t)) + k_{21}\,k_{31}\,k_{41}\,k_{e2}^2\,k_{p2}\,k_{e1}\,x_1(t)$$

$$+k_{21}\,k_{31}\,k_{41}^2\,k_{p2}\,k_{e2}\,(\frac{d}{dt}\,x_1(t)) + k_{21}\,k_{31}\,k_{41}\,k_{e2}^2\,k_{p2}\,(\frac{d}{dt}\,x_1(t))$$

$$+k_{21}\,k_{31}\,k_{41}^2\,k_{p2}\,k_{e2}\,k_{e1}\,x_1(t) + k_{21}\,k_{31}^2\,k_{e2}\,k_{p2}\,(\frac{d}{dt}\,x_1(t))\,k_{41}$$

$$+k_{21}\,k_{31}^2\,k_{41}\,k_{e2}\,k_{p2}\,k_{e1}\,x_1(t) + k_{21}\,k_{31}^2\,k_{41}^2\,k_{p2}\,k_{e1}\,x_1(t)$$

$$+k_{21}\,k_{31}^2\,k_{41}^2\,k_{p2}\,(\frac{d}{dt}\,x_1(t)) + 2\,k_{21}^3\,k_{e2}\,k_{p2}\,k_{e1}\,(\frac{d}{dt}\,x_1(t))$$

$$-2\,k_{21}^2\,k_{31}\,k_{e2}\,k_{p2}\,(\frac{d}{dt}\,x_1(t))\,k_{41} - 2\,k_{21}^2\,k_{31}\,k_{41}\,k_{e2}\,k_{p2}\,k_{e1}\,x_1(t)$$

$$+k_{21}^2\,k_{p2}\,(\frac{d^4}{dt^4}\,x_1(t)) + k_{21}^3\,k_{p2}\,(\frac{d^3}{dt^3}\,x_1(t)) + k_{21}^2\,k_{p2}\,k_{e1}\,(\frac{d^3}{dt^3}\,x_1(t))$$

$$-k_{31}\,k_{41}^2\,k_{p4}\,(\frac{d^3}{dt^3}\,x_1(t)) - k_{31}^2\,k_{41}\,k_{p3}\,(\frac{d^3}{dt^3}\,x_1(t))$$

$$+2\,k_{21}^3\,k_{e2}\,k_{p2}\,(\frac{d^2}{dt^2}\,x_1(t)) - k_{21}^2\,k_{31}\,k_{p2}\,k_{41}\,(\frac{d^2}{dt^2}\,x_1(t))$$

$$-k_{31}\,k_{41}^2\,k_{p4}\,k_{e1}\,(\frac{d^2}{dt^2}\,x_1(t)) - k_{31}^2\,k_{41}\,k_{p3}\,k_{e1}\,(\frac{d^2}{dt^2}\,x_1(t))$$

$$-k_{21}\,k_{31}\,k_{41}\,k_{p2}\,k_{e1}\,(\frac{d^2}{dt^2}\,x_1(t)) - k_{21}\,k_{31}\,k_{41}\,k_{e2}\,k_{p2}\,(\frac{d^2}{dt^2}\,x_1(t))$$

$$-k_{21}\,k_{31}\,k_{41}\,k_{p2}\,(\frac{d^3}{dt^3}\,x_1(t)))/(k_{21}(k_{31}^2\,k_{41}^2\,k_{p4}\,k_{e2}$$

$$-k_{21}^2\,k_{41}\,k_{p2}\,k_{e2}^2 - k_{21}^2\,k_{31}\,k_{p2}\,k_{e2}^2 - k_{21}^2\,k_{41}^2\,k_{p2}\,k_{e2}$$

$$-k_{21}^2\,k_{31}^2\,k_{41}\,k_{p2} - k_{21}^2\,k_{31}\,k_{41}^2\,k_{p2} - k_{21}^2\,k_{31}^2\,k_{p2}\,k_{e2}$$

$$+k_{21}\,k_{31}^2\,k_{41}^2\,k_{p2} + k_{31}^2\,k_{41}\,k_{e2}^2\,k_{p3} + k_{31}^2\,k_{41}^2\,k_{e2}\,k_{p3}$$

$$+k_{21}\,k_{41}^2\,k_{31}^2\,k_{p4} - k_{21}\,k_{e2}^2\,k_{p3}\,k_{31}^2 + k_{31}\,k_{41}^2\,k_{e2}^2\,k_{p4}$$

$$+k_{21}\,k_{41}^2\,k_{31}^2\,k_{p3} - k_{21}^2\,k_{41}^2\,k_{p3}\,k_{31} - k_{21}\,k_{41}^2\,k_{e2}^2\,k_{p4}$$

$$-k_{21}^2\,k_{41}^2\,k_{31}\,k_{p4} - k_{21}^2\,k_{41}\,k_{31}^2\,k_{p3} - k_{21}^2\,k_{e2}\,k_{31}^2\,k_{p3}$$

$$-k_{21}^2\,k_{41}^2\,k_{e2}\,k_{p4} - k_{21}^2\,k_{p4}\,k_{41}\,k_{31}^2 + k_{21}\,k_{31}^3\,k_{41}\,k_{p2}\,k_{e2}$$

$$+k_{21}\,k_{31}\,k_{41}\,k_{p2}\,k_{e2}^2 - k_{21}\,k_{e2}\,k_{31}^2\,k_{p4}\,k_{41} - k_{21}\,k_{e2}^2\,k_{p4}\,k_{41}\,k_{31}$$

$$-k_{21}\,k_{41}\,k_{e2}^2\,k_{p3}\,k_{31} + k_{21}^3\,k_{p2}\,k_{e2}^2 + k_{21}\,k_{31}\,k_{41}^3\,k_{p2}\,k_{e2}$$

$$-k_{21}\,k_{41}^2\,k_{e2}\,k_{p3}\,k_{31} + k_{21}^3\,k_{31}\,k_{p2}\,k_{e2} + k_{21}^3\,k_{41}\,k_{p2}\,k_{e2}$$

$$+k_{21}^3\,k_{31}\,k_{41}\,k_{p2} + k_{21}^2\,k_{p4}\,k_{e2}^2\,k_{41} + k_{21}^2\,k_{p3}\,k_{e2}^2\,k_{31}$$

$$+k_{21}^3\,k_{e2}\,k_{p4}\,k_{41} + k_{21}^3\,k_{e2}\,k_{p3}\,k_{31} + k_{21}^3\,k_{41}\,k_{p3}\,k_{31}$$

$$+k_{21}^3\,k_{p4}\,k_{41}\,k_{31} - 2\,k_{21}^2\,k_{31}\,k_{41}\,k_{p2}\,k_{e2})) - x_2(t) = 0$$

$$C_{5,t} = -(\frac{d^3}{dt^3}\,x_1(t))\,k_{21}\,k_{41} - (\frac{d^4}{dt^4}\,x_1(t))\,k_{e1} - (\frac{d^4}{dt^4}\,x_1(t))\,k_{21} \qquad (5)$$

$$-(\frac{d^4}{dt^4}\,x_1(t))\,k_{31} - (\frac{d^4}{dt^4}\,x_1(t))\,k_{41} - (\frac{d^2}{dt^2}\,x_1(t))\,k_{e2}^3 - 3\,(\frac{d^3}{dt^3}\,x_1(t))\,k_{e2}^2$$

$$-3\,(\frac{d^4}{dt^4}\,x_1(t))\,k_{e2} - k_{e1}\,(\frac{d}{dt}\,x_1(t))\,k_{e2}^3 - (\frac{d^2}{dt^2}\,x_1(t))\,k_{41}\,k_{e2}^2$$

$$-k_{e1}\,(\frac{d}{dt}\,x_1(t))\,k_{21}\,k_{e2}^2 - k_{e1}\,(\frac{d}{dt}\,x_1(t))\,k_{41}\,k_{e2}^2$$

$$-k_{e1}\,(\frac{d}{dt}\,x_1(t))\,k_{31}\,k_{e2}^2 - k_{e1}\,(\frac{d^2}{dt^2}\,x_1(t))\,k_{21}\,k_{41}$$

$$-k_{e1}\left(\frac{d^2}{dt^2}x_1(t)\right)k_{21}k_{31} - k_{e1}\left(\frac{d^2}{dt^2}x_1(t)\right)k_{41}k_{31}$$

$$-\left(\frac{d^2}{dt^2}x_1(t)\right)k_{41}k_{31}k_{21} - \left(\frac{d^2}{dt^2}x_1(t)\right)k_{41}k_{e2}k_{21}$$

$$-\left(\frac{d^2}{dt^2}x_1(t)\right)k_{31}k_{e2}k_{21} - \left(\frac{d^2}{dt^2}x_1(t)\right)k_{41}k_{e2}k_{31}$$

$$-2\,k_{e1}\left(\frac{d^2}{dt^2}x_1(t)\right)k_{21}k_{e2} - 2\,k_{e1}\left(\frac{d^2}{dt^2}x_1(t)\right)k_{41}k_{e2}$$

$$-2\,k_{e1}\left(\frac{d^2}{dt^2}x_1(t)\right)k_{31}k_{e2} - k_{e1}\left(\frac{d}{dt}x_1(t)\right)k_{31}k_{e2}k_{21}$$

$$-k_{e1}\left(\frac{d}{dt}x_1(t)\right)k_{41}k_{e2}k_{31} - k_{e1}\left(\frac{d}{dt}x_1(t)\right)k_{41}k_{31}k_{21}$$

$$-k_{e1}\left(\frac{d}{dt}x_1(t)\right)k_{41}k_{e2}k_{21} - k_{e1}\left(\frac{d^3}{dt^3}x_1(t)\right)k_{31} - k_{e1}\left(\frac{d^3}{dt^3}x_1(t)\right)k_{21}$$

$$-k_{e1}\left(\frac{d^3}{dt^3}x_1(t)\right)k_{41} - \left(\frac{d^2}{dt^2}x_1(t)\right)k_{21}k_{e2}^2 - \left(\frac{d^2}{dt^2}x_1(t)\right)k_{31}k_{e2}^2$$

$$-\left(\frac{d^3}{dt^3}x_1(t)\right)k_{21}k_{31} - \left(\frac{d^3}{dt^3}x_1(t)\right)k_{41}k_{31} - 3\,k_{e1}\left(\frac{d^2}{dt^2}x_1(t)\right)k_{e2}^2$$

$$-3\,k_{e1}\left(\frac{d^3}{dt^3}x_1(t)\right)k_{e2} - 2\left(\frac{d^3}{dt^3}x_1(t)\right)k_{21}k_{e2} - 2\left(\frac{d^3}{dt^3}x_1(t)\right)k_{41}k_{e2}$$

$$-2\left(\frac{d^3}{dt^3}x_1(t)\right)k_{31}k_{e2} - \frac{d^5}{dt^5}x_1(t) = 0$$