

Minimal Constraint Subsets Detected for differential trail in Table 9 DDH21+

the 0 th Minimal Constraint set is:

$$\begin{aligned}y^{\wedge}0_0 + x^{\wedge}1_4 + k1_0 + k2_0_0 + k3_0_0 &= 0 \\y^{\wedge}0_0 + y^{\wedge}0_{10} + x^{\wedge}1_{12} + k1_0 + k2_0_0 + k3_0_0 &= 0 \\y^{\wedge}0_2 + [y^{\wedge}0_8] + [y^{\wedge}0_{15}] + x^{\wedge}1_2 + k1_2 + k2_2_0 + k3_2_0 &= 0 \\y^{\wedge}0_2 + x^{\wedge}1_6 + k1_2 + k2_2_0 + k3_2_0 &= 0 \\[y^{\wedge}0_7] + y^{\wedge}0_{10} + x^{\wedge}1_8 + k1_7 + k2_7_0 + k3_7_0 &= 0 \\y^{\wedge}1_1 + y^{\wedge}1_{11} + [y^{\wedge}1_{14}] + [x^{\wedge}2_1] + k1_{15} + k2_{15_0} + k3_{15_0} &= 0 \\y^{\wedge}1_1 + x^{\wedge}2_5 + k1_{15} + k2_{15_0} + k3_{15_0} &= 0 \\y^{\wedge}1_2 + y^{\wedge}1_8 + x^{\wedge}2_{14} + k1_8 + k2_8_0 + k3_8_0 &= 0 \\y^{\wedge}1_3 + y^{\wedge}1_9 + y^{\wedge}1_{12} + [x^{\wedge}2_3] + k1_{13} + k2_{13_0} + k3_{13_0} &= 0 \\y^{\wedge}1_3 + [x^{\wedge}2_7] + k1_{13} + k2_{13_0} + k3_{13_0} &= 0 \\y^{\wedge}1_4 + y^{\wedge}1_{11} + x^{\wedge}2_9 + k1_{10} + k2_{10_0} + k3_{10_0} &= 0 \\y^{\wedge}1_6 + y^{\wedge}1_9 + x^{\wedge}2_{11} + k1_{12} + k2_{12_0} + k3_{12_0} &= 0 \\y^{\wedge}2_0 + x^{\wedge}3_4 + k1_1 + k2_1_1 + k3_1_1 &= 0 \\y^{\wedge}2_0 + y^{\wedge}2_{10} + x^{\wedge}3_{12} + k1_1 + k2_1_1 + k3_1_1 &= 0 \\[y^{\wedge}2_1] + y^{\wedge}2_{11} + y^{\wedge}2_{14} + x^{\wedge}3_1 + k1_7 + k2_7_1 + k3_7_1 &= 0 \\y^{\wedge}2_2 + x^{\wedge}3_6 + k1_0 + k2_0_1 + k3_0_1 &= 0 \\y^{\wedge}2_2 + y^{\wedge}2_8 + x^{\wedge}3_{14} + k1_0 + k2_0_1 + k3_0_1 &= 0 \\[y^{\wedge}2_3] + y^{\wedge}2_9 + x^{\wedge}3_{15} + k1_5 + k2_5_1 + k3_5_1 &= 0 \\y^{\wedge}2_5 + y^{\wedge}2_8 + x^{\wedge}3_{10} + k1_6 + k2_6_1 + k3_6_1 &= 0 \\[y^{\wedge}2_7] + y^{\wedge}2_{10} + [x^{\wedge}3_8] + k1_3 + k2_3_1 + k3_3_1 &= 0 \\y^{\wedge}3_0 + x^{\wedge}4_4 + k1_{15} + k2_{15_1} + k3_{15_1} &= 0 \\y^{\wedge}3_0 + y^{\wedge}3_{10} + x^{\wedge}4_{12} + k1_{15} + k2_{15_1} + k3_{15_1} &= 0 \\y^{\wedge}3_1 + y^{\wedge}3_{11} + y^{\wedge}3_{14} + x^{\wedge}4_1 + k1_{11} + k2_{11_1} + k3_{11_1} &= 0 \\[y^{\wedge}3_2] + [y^{\wedge}3_8] + y^{\wedge}3_{15} + x^{\wedge}4_2 + k1_9 + k2_9_1 + k3_9_1 &= 0 \\y^{\wedge}3_3 + y^{\wedge}3_9 + y^{\wedge}3_{12} + x^{\wedge}4_3 + k1_{14} + k2_{14_1} + k3_{14_1} &= 0 \\y^{\wedge}3_3 + x^{\wedge}4_7 + k1_{14} + k2_{14_1} + k3_{14_1} &= 0 \\y^{\wedge}3_4 + y^{\wedge}3_{11} + x^{\wedge}4_9 + k1_8 + k2_8_1 + k3_8_1 &= 0 \\y^{\wedge}3_6 + y^{\wedge}3_9 + x^{\wedge}4_{11} + k1_{10} + k2_{10_1} + k3_{10_1} &= 0 \\y^{\wedge}4_1 + x^{\wedge}5_5 + k1_3 + k2_3_2 + k3_3_2 &= 0 \\y^{\wedge}4_2 + x^{\wedge}5_6 + k1_1 + k2_1_2 + k3_1_2 &= 0 \\y^{\wedge}4_3 + y^{\wedge}4_9 + y^{\wedge}4_{12} + x^{\wedge}5_3 + k1_6 + k2_6_2 + k3_6_2 &= 0 \\y^{\wedge}4_4 + y^{\wedge}4_{11} + x^{\wedge}5_9 + k1_0 + k2_0_2 + k3_0_2 &= 0 \\y^{\wedge}4_7 + [y^{\wedge}4_{10}] + x^{\wedge}5_8 + k1_5 + k2_5_2 + k3_5_2 &= 0 \\y^{\wedge}5_3 + x^{\wedge}6_7 + k1_{12} + k2_{12_2} + k3_{12_2} &= 0 \\[y^{\wedge}5_4] + [y^{\wedge}5_{11}] + x^{\wedge}6_9 + k1_9 + k2_9_2 + k3_9_2 &= 0 \\y^{\wedge}5_5 + y^{\wedge}5_8 + x^{\wedge}6_{10} + k1_{10} + k2_{10_2} + k3_{10_2} &= 0 \\y^{\wedge}5_6 + y^{\wedge}5_9 + x^{\wedge}6_{11} + k1_8 + k2_8_2 + k3_8_2 &= 0 \\y^{\wedge}6_0 + y^{\wedge}6_{10} + [y^{\wedge}6_{13}] + [x^{\wedge}7_0] + k1_3 + k2_3_3 + k3_3_3 &= 0 \\y^{\wedge}6_0 + y^{\wedge}6_{10} + x^{\wedge}7_{12} + k1_3 + k2_3_3 + k3_3_3 &= 0 \\[y^{\wedge}6_1] + y^{\wedge}6_{11} + x^{\wedge}7_{13} + k1_5 + k2_5_3 + k3_5_3 &= 0 \\y^{\wedge}6_3 + x^{\wedge}7_7 + k1_4 + k2_4_3 + k3_4_3 &= 0\end{aligned}$$

$$\begin{aligned}
&y^6_3 + y^6_9 + x^7_{15} + k1_4 + k2_{4_3} + k3_{4_3} = 0 \\
&y^6_7 + y^6_{10} + x^7_8 + k1_6 + k2_{6_3} + k3_{6_3} = 0 \\
&[y^7_0] + y^7_{10} + y^7_{13} + x^8_0 + k1_{13} + k2_{13_3} + k3_{13_3} = 0 \\
&y^7_2 + y^7_8 + y^7_{15} + x^8_2 + k1_{11} + k2_{11_3} + k3_{11_3} = 0 \\
&y^7_2 + x^8_6 + k1_{11} + k2_{11_3} + k3_{11_3} = 0 \\
&y^7_3 + y^7_9 + y^7_{12} + x^8_3 + k1_{10} + k2_{10_3} + k3_{10_3} = 0 \\
&y^7_3 + y^7_9 + x^8_{15} + k1_{10} + k2_{10_3} + k3_{10_3} = 0 \\
&y^7_7 + y^7_{10} + x^8_8 + k1_{12} + k2_{12_3} + k3_{12_3} = 0 \\
&y^8_0 + x^9_4 + k1_5 + k2_{5_4} + k3_{5_4} = 0 \\
&y^8_2 + y^8_8 + y^8_{15} + x^9_2 + k1_3 + k2_{3_4} + k3_{3_4} = 0 \\
&y^8_3 + y^8_9 + x^9_{15} + k1_2 + k2_{2_4} + k3_{2_4} = 0 \\
&y^8_6 + y^8_9 + x^9_{11} + k1_1 + k2_{1_4} + k3_{1_4} = 0 \\
&y^9_2 + y^9_8 + y^9_{15} + [x^{10}_2] + k1_{13} + k2_{13_4} + k3_{13_4} = 0 \\
&y^9_2 + [x^{10}_6] + k1_{13} + k2_{13_4} + k3_{13_4} = 0 \\
&y^9_2 + y^9_8 + [x^{10}_{14}] + k1_{13} + k2_{13_4} + k3_{13_4} = 0 \\
&y^9_4 + y^9_{11} + x^{10}_9 + k1_{11} + k2_{11_4} + k3_{11_4} = 0 \\
&[y^{10}_6] + y^{10}_9 + [x^{11}_{11}] + k1_7 + k2_{7_5} + k3_{7_5} = 0 \\
&S(x^1_2) + y^1_2 = 0 \\
&S(x^1_4) + y^1_4 = 0 \\
&S(x^1_6) + y^1_6 = 0 \\
&S(x^1_8) + y^1_8 = 0 \\
&S(x^1_{12}) + y^1_{12} = 0 \\
&S(x^2_5) + y^2_5 = 0 \\
&S(x^2_9) + y^2_9 = 0 \\
&S(x^2_{11}) + y^2_{11} = 0 \\
&S(x^2_{14}) + y^2_{14} = 0 \\
&S(x^3_1) + y^3_1 = 0 \\
&S(x^3_4) + y^3_4 = 0 \\
&S(x^3_6) + y^3_6 = 0 \\
&S(x^3_{10}) + y^3_{10} = 0 \\
&S(x^3_{12}) + y^3_{12} = 0 \\
&S(x^3_{14}) + y^3_{14} = 0 \\
&S(x^3_{15}) + y^3_{15} = 0 \\
&S(x^4_1) + y^4_1 = 0 \\
&S(x^4_2) + y^4_2 = 0 \\
&S(x^4_3) + y^4_3 = 0 \\
&S(x^4_4) + y^4_4 = 0 \\
&S(x^4_7) + y^4_7 = 0 \\
&S(x^4_9) + y^4_9 = 0 \\
&S(x^4_{11}) + y^4_{11} = 0 \\
&S(x^4_{12}) + y^4_{12} = 0 \\
&S(x^5_3) + y^5_3 = 0 \\
&S(x^5_5) + y^5_5 = 0 \\
&S(x^5_6) + y^5_6 = 0
\end{aligned}$$

$$\begin{aligned}
S(x^{5_8}) + y^{5_8} &= 0 \\
S(x^{5_9}) + y^{5_9} &= 0 \\
S(x^{6_7}) + y^{6_7} &= 0 \\
S(x^{6_9}) + y^{6_9} &= 0 \\
S(x^{6_{10}}) + y^{6_{10}} &= 0 \\
S(x^{6_{11}}) + y^{6_{11}} &= 0 \\
S(x^{7_7}) + y^{7_7} &= 0 \\
S(x^{7_8}) + y^{7_8} &= 0 \\
S(x^{7_{12}}) + y^{7_{12}} &= 0 \\
S(x^{7_{13}}) + y^{7_{13}} &= 0 \\
S(x^{7_{15}}) + y^{7_{15}} &= 0 \\
S(x^{8_0}) + y^{8_0} &= 0 \\
S(x^{8_2}) + y^{8_2} &= 0 \\
S(x^{8_3}) + y^{8_3} &= 0 \\
S(x^{8_6}) + y^{8_6} &= 0 \\
S(x^{8_8}) + y^{8_8} &= 0 \\
S(x^{8_{15}}) + y^{8_{15}} &= 0 \\
S(x^{9_2}) + y^{9_2} &= 0 \\
S(x^{9_4}) + y^{9_4} &= 0 \\
S(x^{9_{11}}) + y^{9_{11}} &= 0 \\
S(x^{9_{15}}) + y^{9_{15}} &= 0 \\
S(x^{10_9}) + y^{10_9} &= 0
\end{aligned}$$

the 1 th Minimal Constraint set is:

$$\begin{aligned}
y^{0_0} + x^{1_4} + k_{1_0} + k_{2_0_0} + k_{3_0_0} &= 0 \\
y^{0_0} + y^{0_{10}} + x^{1_{12}} + k_{1_0} + k_{2_0_0} + k_{3_0_0} &= 0 \\
[y^{0_7}] + y^{0_{10}} + x^{1_8} + k_{1_7} + k_{2_7_0} + k_{3_7_0} &= 0 \\
y^{1_1} + y^{1_{11}} + [y^{1_{14}}] + [x^{2_1}] + k_{1_{15}} + k_{2_{15_0}} + k_{3_{15_0}} &= 0 \\
y^{1_1} + x^{2_5} + k_{1_{15}} + k_{2_{15_0}} + k_{3_{15_0}} &= 0 \\
y^{1_2} + x^{2_6} + k_{1_8} + k_{2_8_0} + k_{3_8_0} &= 0 \\
y^{1_2} + y^{1_8} + x^{2_{14}} + k_{1_8} + k_{2_8_0} + k_{3_8_0} &= 0 \\
y^{1_3} + y^{1_9} + y^{1_{12}} + [x^{2_3}] + k_{1_{13}} + k_{2_{13_0}} + k_{3_{13_0}} &= 0 \\
y^{1_3} + y^{1_9} + [x^{2_{15}}] + k_{1_{13}} + k_{2_{13_0}} + k_{3_{13_0}} &= 0 \\
y^{1_4} + y^{1_{11}} + x^{2_9} + k_{1_{10}} + k_{2_{10_0}} + k_{3_{10_0}} &= 0 \\
y^{2_0} + x^{3_4} + k_{1_1} + k_{2_{1_1}} + k_{3_{1_1}} &= 0 \\
y^{2_0} + y^{2_{10}} + x^{3_{12}} + k_{1_1} + k_{2_{1_1}} + k_{3_{1_1}} &= 0 \\
[y^{2_1}] + y^{2_{11}} + y^{2_{14}} + x^{3_1} + k_{1_7} + k_{2_{7_1}} + k_{3_{7_1}} &= 0 \\
[y^{2_1}] + y^{2_{11}} + x^{3_{13}} + k_{1_7} + k_{2_{7_1}} + k_{3_{7_1}} &= 0 \\
y^{2_2} + x^{3_6} + k_{1_0} + k_{2_{0_1}} + k_{3_{0_1}} &= 0 \\
y^{2_2} + y^{2_8} + x^{3_{14}} + k_{1_0} + k_{2_{0_1}} + k_{3_{0_1}} &= 0 \\
[y^{2_3}] + x^{3_7} + k_{1_5} + k_{2_{5_1}} + k_{3_{5_1}} &= 0 \\
y^{2_5} + y^{2_8} + x^{3_{10}} + k_{1_6} + k_{2_{6_1}} + k_{3_{6_1}} &= 0 \\
y^{2_6} + y^{2_9} + x^{3_{11}} + k_{1_4} + k_{2_{4_1}} + k_{3_{4_1}} &= 0 \\
[y^{2_7}] + y^{2_{10}} + [x^{3_8}] + k_{1_3} + k_{2_{3_1}} + k_{3_{3_1}} &= 0 \\
y^{3_0} + y^{3_{10}} + y^{3_{13}} + x^{4_0} + k_{1_{15}} + k_{2_{15_1}} + k_{3_{15_1}} &= 0
\end{aligned}$$

$$\begin{aligned}
&y^3_0 + y^3_{10} + x^4_{12} + k1_{15} + k2_{15_1} + k3_{15_1} = 0 \\
&y^3_1 + y^3_{11} + y^3_{14} + x^4_1 + k1_{11} + k2_{11_1} + k3_{11_1} = 0 \\
&y^3_1 + x^4_5 + k1_{11} + k2_{11_1} + k3_{11_1} = 0 \\
&y^3_1 + y^3_{11} + x^4_{13} + k1_{11} + k2_{11_1} + k3_{11_1} = 0 \\
&y^3_3 + y^3_9 + y^3_{12} + x^4_3 + k1_{14} + k2_{14_1} + k3_{14_1} = 0 \\
&y^3_3 + x^4_7 + k1_{14} + k2_{14_1} + k3_{14_1} = 0 \\
&y^3_4 + y^3_{11} + x^4_9 + k1_8 + k2_{8_1} + k3_{8_1} = 0 \\
&y^3_6 + y^3_9 + x^4_{11} + k1_{10} + k2_{10_1} + k3_{10_1} = 0 \\
&y^3_7 + y^3_{10} + x^4_8 + k1_{13} + k2_{13_1} + k3_{13_1} = 0 \\
&y^4_0 + [y^4_{10}] + y^4_{13} + x^5_0 + k1_7 + k2_{7_2} + k3_{7_2} = 0 \\
&y^4_0 + [x^5_4] + k1_7 + k2_{7_2} + k3_{7_2} = 0 \\
&y^4_0 + [y^4_{10}] + x^5_{12} + k1_7 + k2_{7_2} + k3_{7_2} = 0 \\
&y^4_1 + y^4_{11} + x^5_{13} + k1_3 + k2_{3_2} + k3_{3_2} = 0 \\
&y^4_3 + y^4_9 + y^4_{12} + x^5_3 + k1_6 + k2_{6_2} + k3_{6_2} = 0 \\
&y^4_5 + y^4_8 + x^5_{10} + k1_4 + k2_{4_2} + k3_{4_2} = 0 \\
&y^4_7 + [y^4_{10}] + x^5_8 + k1_5 + k2_{5_2} + k3_{5_2} = 0 \\
&y^5_0 + y^5_{10} + y^5_{13} + x^6_0 + k1_{11} + k2_{11_2} + k3_{11_2} = 0 \\
&y^5_2 + x^6_6 + k1_{15} + k2_{15_2} + k3_{15_2} = 0 \\
&y^5_2 + y^5_8 + x^6_{14} + k1_{15} + k2_{15_2} + k3_{15_2} = 0 \\
&y^5_3 + y^5_9 + y^5_{12} + x^6_3 + k1_{12} + k2_{12_2} + k3_{12_2} = 0 \\
&y^5_3 + x^6_7 + k1_{12} + k2_{12_2} + k3_{12_2} = 0 \\
&y^5_3 + y^5_9 + x^6_{15} + k1_{12} + k2_{12_2} + k3_{12_2} = 0 \\
&[y^5_4] + [y^5_{11}] + x^6_9 + k1_9 + k2_{9_2} + k3_{9_2} = 0 \\
&y^6_0 + y^6_{10} + [y^6_{13}] + [x^7_0] + k1_3 + k2_{3_3} + k3_{3_3} = 0 \\
&[y^6_1] + y^6_{11} + y^6_{14} + x^7_1 + k1_5 + k2_{5_3} + k3_{5_3} = 0 \\
&[y^6_1] + y^6_{11} + x^7_{13} + k1_5 + k2_{5_3} + k3_{5_3} = 0 \\
&y^6_2 + y^6_8 + y^6_{15} + x^7_2 + k1_7 + k2_{7_3} + k3_{7_3} = 0 \\
&y^6_2 + y^6_8 + x^7_{14} + k1_7 + k2_{7_3} + k3_{7_3} = 0 \\
&y^6_3 + x^7_7 + k1_4 + k2_{4_3} + k3_{4_3} = 0 \\
&y^6_6 + y^6_9 + x^7_{11} + k1_0 + k2_{0_3} + k3_{0_3} = 0 \\
&y^6_7 + y^6_{10} + x^7_8 + k1_6 + k2_{6_3} + k3_{6_3} = 0 \\
&[y^7_0] + y^7_{10} + y^7_{13} + x^8_0 + k1_{13} + k2_{13_3} + k3_{13_3} = 0 \\
&[y^7_0] + x^8_4 + k1_{13} + k2_{13_3} + k3_{13_3} = 0 \\
&y^7_1 + y^7_{11} + y^7_{14} + x^8_1 + k1_{14} + k2_{14_3} + k3_{14_3} = 0 \\
&y^7_2 + y^7_8 + x^8_{14} + k1_{11} + k2_{11_3} + k3_{11_3} = 0 \\
&y^7_7 + y^7_{10} + x^8_8 + k1_{12} + k2_{12_3} + k3_{12_3} = 0 \\
&y^8_0 + x^9_4 + k1_5 + k2_{5_4} + k3_{5_4} = 0 \\
&y^8_1 + y^8_{11} + y^8_{14} + x^9_1 + k1_6 + k2_{6_4} + k3_{6_4} = 0 \\
&y^8_2 + x^9_6 + k1_3 + k2_{3_4} + k3_{3_4} = 0 \\
&y^8_2 + y^8_8 + x^9_{14} + k1_3 + k2_{3_4} + k3_{3_4} = 0 \\
&y^8_4 + y^8_{11} + x^9_9 + k1_7 + k2_{7_4} + k3_{7_4} = 0 \\
&y^9_1 + y^9_{11} + y^9_{14} + x^{10}_1 + k1_{12} + k2_{12_4} + k3_{12_4} = 0 \\
&y^9_4 + y^9_{11} + x^{10}_9 + k1_{11} + k2_{11_4} + k3_{11_4} = 0 \\
&y^9_6 + y^9_9 + x^{10}_{11} + k1_{15} + k2_{15_4} + k3_{15_4} = 0
\end{aligned}$$

$$y^{10}_1 + y^{10}_{11} + [y^{10}_{14}] + [x^{11}_1] + k_{1_4} + k_{2_4_5} + k_{3_4_5} = 0$$

$$[y^{10}_6] + y^{10}_9 + [x^{11}_{11}] + k_{1_7} + k_{2_7_5} + k_{3_7_5} = 0$$

$$S(x^1_4) + y^1_4 = 0$$

$$S(x^1_8) + y^1_8 = 0$$

$$S(x^1_{12}) + y^1_{12} = 0$$

$$S(x^2_5) + y^2_5 = 0$$

$$S(x^2_6) + y^2_6 = 0$$

$$S(x^2_9) + y^2_9 = 0$$

$$S(x^2_{14}) + y^2_{14} = 0$$

$$S(x^3_1) + y^3_1 = 0$$

$$S(x^3_4) + y^3_4 = 0$$

$$S(x^3_6) + y^3_6 = 0$$

$$S(x^3_7) + y^3_7 = 0$$

$$S(x^3_{10}) + y^3_{10} = 0$$

$$S(x^3_{11}) + y^3_{11} = 0$$

$$S(x^3_{12}) + y^3_{12} = 0$$

$$S(x^3_{13}) + y^3_{13} = 0$$

$$S(x^3_{14}) + y^3_{14} = 0$$

$$S(x^4_0) + y^4_0 = 0$$

$$S(x^4_1) + y^4_1 = 0$$

$$S(x^4_3) + y^4_3 = 0$$

$$S(x^4_5) + y^4_5 = 0$$

$$S(x^4_7) + y^4_7 = 0$$

$$S(x^4_8) + y^4_8 = 0$$

$$S(x^4_9) + y^4_9 = 0$$

$$S(x^4_{11}) + y^4_{11} = 0$$

$$S(x^4_{12}) + y^4_{12} = 0$$

$$S(x^4_{13}) + y^4_{13} = 0$$

$$S(x^5_0) + y^5_0 = 0$$

$$S(x^5_3) + y^5_3 = 0$$

$$S(x^5_8) + y^5_8 = 0$$

$$S(x^5_{10}) + y^5_{10} = 0$$

$$S(x^5_{12}) + y^5_{12} = 0$$

$$S(x^5_{13}) + y^5_{13} = 0$$

$$S(x^6_0) + y^6_0 = 0$$

$$S(x^6_3) + y^6_3 = 0$$

$$S(x^6_6) + y^6_6 = 0$$

$$S(x^6_7) + y^6_7 = 0$$

$$S(x^6_9) + y^6_9 = 0$$

$$S(x^6_{14}) + y^6_{14} = 0$$

$$S(x^6_{15}) + y^6_{15} = 0$$

$$S(x^7_1) + y^7_1 = 0$$

$$S(x^7_2) + y^7_2 = 0$$

$$S(x^7_7) + y^7_7 = 0$$

$$\begin{aligned}
S(x^{7_8}) + y^{7_8} &= 0 \\
S(x^{7_{11}}) + y^{7_{11}} &= 0 \\
S(x^{7_{13}}) + y^{7_{13}} &= 0 \\
S(x^{7_{14}}) + y^{7_{14}} &= 0 \\
S(x^{8_0}) + y^{8_0} &= 0 \\
S(x^{8_1}) + y^{8_1} &= 0 \\
S(x^{8_4}) + y^{8_4} &= 0 \\
S(x^{8_8}) + y^{8_8} &= 0 \\
S(x^{8_{14}}) + y^{8_{14}} &= 0 \\
S(x^{9_1}) + y^{9_1} &= 0 \\
S(x^{9_4}) + y^{9_4} &= 0 \\
S(x^{9_6}) + y^{9_6} &= 0 \\
S(x^{9_9}) + y^{9_9} &= 0 \\
S(x^{9_{14}}) + y^{9_{14}} &= 0 \\
S(x^{10_1}) + y^{10_1} &= 0 \\
S(x^{10_9}) + y^{10_9} &= 0 \\
S(x^{10_{11}}) + y^{10_{11}} &= 0
\end{aligned}$$

the 2 th Minimal Constraint set is:

$$\begin{aligned}
y^{0_0} + x^{1_4} + k_{1_0} + k_{2_0_0} + k_{3_0_0} &= 0 \\
y^{0_0} + y^{0_{10}} + x^{1_{12}} + k_{1_0} + k_{2_0_0} + k_{3_0_0} &= 0 \\
[y^{0_7}] + y^{0_{10}} + x^{1_8} + k_{1_7} + k_{2_7_0} + k_{3_7_0} &= 0 \\
y^{1_1} + x^{2_5} + k_{1_{15}} + k_{2_{15_0}} + k_{3_{15_0}} &= 0 \\
y^{1_1} + y^{1_{11}} + x^{2_{13}} + k_{1_{15}} + k_{2_{15_0}} + k_{3_{15_0}} &= 0 \\
y^{1_2} + x^{2_6} + k_{1_8} + k_{2_8_0} + k_{3_8_0} &= 0 \\
y^{1_2} + y^{1_8} + x^{2_{14}} + k_{1_8} + k_{2_8_0} + k_{3_8_0} &= 0 \\
y^{1_3} + y^{1_9} + y^{1_{12}} + [x^{2_3}] + k_{1_{13}} + k_{2_{13_0}} + k_{3_{13_0}} &= 0 \\
y^{1_3} + y^{1_9} + [x^{2_{15}}] + k_{1_{13}} + k_{2_{13_0}} + k_{3_{13_0}} &= 0 \\
y^{1_4} + y^{1_{11}} + x^{2_9} + k_{1_{10}} + k_{2_{10_0}} + k_{3_{10_0}} &= 0 \\
y^{2_0} + y^{2_{10}} + y^{2_{13}} + x^{3_0} + k_{1_1} + k_{2_{1_1}} + k_{3_{1_1}} &= 0 \\
y^{2_0} + y^{2_{10}} + x^{3_{12}} + k_{1_1} + k_{2_{1_1}} + k_{3_{1_1}} &= 0 \\
[y^{2_1}] + y^{2_{11}} + y^{2_{14}} + x^{3_1} + k_{1_7} + k_{2_{7_1}} + k_{3_{7_1}} &= 0 \\
[y^{2_1}] + y^{2_{11}} + x^{3_{13}} + k_{1_7} + k_{2_{7_1}} + k_{3_{7_1}} &= 0 \\
y^{2_2} + x^{3_6} + k_{1_0} + k_{2_{0_1}} + k_{3_{0_1}} &= 0 \\
y^{2_2} + y^{2_8} + x^{3_{14}} + k_{1_0} + k_{2_{0_1}} + k_{3_{0_1}} &= 0 \\
y^{2_5} + y^{2_8} + x^{3_{10}} + k_{1_6} + k_{2_{6_1}} + k_{3_{6_1}} &= 0 \\
y^{2_6} + y^{2_9} + x^{3_{11}} + k_{1_4} + k_{2_{4_1}} + k_{3_{4_1}} &= 0 \\
y^{3_0} + y^{3_{10}} + y^{3_{13}} + x^{4_0} + k_{1_{15}} + k_{2_{15_1}} + k_{3_{15_1}} &= 0 \\
y^{3_1} + y^{3_{11}} + y^{3_{14}} + x^{4_1} + k_{1_{11}} + k_{2_{11_1}} + k_{3_{11_1}} &= 0 \\
y^{3_3} + y^{3_9} + y^{3_{12}} + x^{4_3} + k_{1_{14}} + k_{2_{14_1}} + k_{3_{14_1}} &= 0 \\
y^{3_3} + x^{4_7} + k_{1_{14}} + k_{2_{14_1}} + k_{3_{14_1}} &= 0 \\
y^{3_6} + y^{3_9} + x^{4_{11}} + k_{1_{10}} + k_{2_{10_1}} + k_{3_{10_1}} &= 0 \\
y^{4_0} + [y^{4_{10}}] + x^{5_{12}} + k_{1_7} + k_{2_{7_2}} + k_{3_{7_2}} &= 0 \\
y^{4_1} + y^{4_{11}} + x^{5_{13}} + k_{1_3} + k_{2_{3_2}} + k_{3_{3_2}} &= 0 \\
y^{4_3} + y^{4_9} + x^{5_{15}} + k_{1_6} + k_{2_{6_2}} + k_{3_{6_2}} &= 0
\end{aligned}$$

$$\begin{aligned}
&[y^4_6] + y^4_9 + [x^5_{11}] + k1_2 + k2_{2_2} + k3_{2_2} = 0 \\
&y^4_7 + [y^4_{10}] + x^5_8 + k1_5 + k2_{5_2} + k3_{5_2} = 0 \\
&y^5_0 + y^5_{10} + y^5_{13} + x^6_0 + k1_{11} + k2_{11_2} + k3_{11_2} = 0 \\
&y^5_0 + y^5_{10} + x^6_{12} + k1_{11} + k2_{11_2} + k3_{11_2} = 0 \\
&y^5_1 + x^6_5 + k1_{13} + k2_{13_2} + k3_{13_2} = 0 \\
&y^5_1 + [y^5_{11}] + [x^6_{13}] + k1_{13} + k2_{13_2} + k3_{13_2} = 0 \\
&y^5_2 + y^5_8 + y^5_{15} + x^6_2 + k1_{15} + k2_{15_2} + k3_{15_2} = 0 \\
&y^5_2 + x^6_6 + k1_{15} + k2_{15_2} + k3_{15_2} = 0 \\
&y^5_3 + y^5_9 + y^5_{12} + x^6_3 + k1_{12} + k2_{12_2} + k3_{12_2} = 0 \\
&y^5_3 + y^5_9 + x^6_{15} + k1_{12} + k2_{12_2} + k3_{12_2} = 0 \\
&[y^5_4] + [y^5_{11}] + x^6_9 + k1_9 + k2_{9_2} + k3_{9_2} = 0 \\
&y^6_0 + y^6_{10} + [y^6_{13}] + [x^7_0] + k1_3 + k2_{3_3} + k3_{3_3} = 0 \\
&y^6_0 + x^7_4 + k1_3 + k2_{3_3} + k3_{3_3} = 0 \\
&y^6_0 + y^6_{10} + x^7_{12} + k1_3 + k2_{3_3} + k3_{3_3} = 0 \\
&[y^6_1] + x^7_5 + k1_5 + k2_{5_3} + k3_{5_3} = 0 \\
&y^6_2 + y^6_8 + y^6_{15} + x^7_2 + k1_7 + k2_{7_3} + k3_{7_3} = 0 \\
&y^6_3 + y^6_9 + y^6_{12} + x^7_3 + k1_4 + k2_{4_3} + k3_{4_3} = 0 \\
&y^6_3 + x^7_7 + k1_4 + k2_{4_3} + k3_{4_3} = 0 \\
&y^6_3 + y^6_9 + x^7_{15} + k1_4 + k2_{4_3} + k3_{4_3} = 0 \\
&y^6_5 + y^6_8 + x^7_{10} + k1_2 + k2_{2_3} + k3_{2_3} = 0 \\
&y^6_6 + y^6_9 + x^7_{11} + k1_0 + k2_{0_3} + k3_{0_3} = 0 \\
&y^7_2 + y^7_8 + y^7_{15} + x^8_2 + k1_{11} + k2_{11_3} + k3_{11_3} = 0 \\
&y^7_3 + y^7_9 + y^7_{12} + x^8_3 + k1_{10} + k2_{10_3} + k3_{10_3} = 0 \\
&y^7_3 + x^8_7 + k1_{10} + k2_{10_3} + k3_{10_3} = 0 \\
&y^7_3 + y^7_9 + x^8_{15} + k1_{10} + k2_{10_3} + k3_{10_3} = 0 \\
&y^7_4 + y^7_{11} + x^8_9 + k1_{15} + k2_{15_3} + k3_{15_3} = 0 \\
&y^7_5 + y^7_8 + x^8_{10} + k1_8 + k2_{8_3} + k3_{8_3} = 0 \\
&y^7_7 + y^7_{10} + x^8_8 + k1_{12} + k2_{12_3} + k3_{12_3} = 0 \\
&y^8_2 + y^8_8 + y^8_{15} + x^9_2 + k1_3 + k2_{3_4} + k3_{3_4} = 0 \\
&y^8_3 + y^8_9 + x^9_{15} + k1_2 + k2_{2_4} + k3_{2_4} = 0 \\
&y^8_7 + y^8_{10} + x^9_8 + k1_4 + k2_{4_4} + k3_{4_4} = 0 \\
&y^9_2 + y^9_8 + y^9_{15} + [x^{10}_2] + k1_{13} + k2_{13_4} + k3_{13_4} = 0 \\
&S(x^{1_4}) + y^{1_4} = 0 \\
&S(x^{1_8}) + y^{1_8} = 0 \\
&S(x^{1_{12}}) + y^{1_{12}} = 0 \\
&S(x^{2_5}) + y^{2_5} = 0 \\
&S(x^{2_6}) + y^{2_6} = 0 \\
&S(x^{2_9}) + y^{2_9} = 0 \\
&S(x^{2_{13}}) + y^{2_{13}} = 0 \\
&S(x^{2_{14}}) + y^{2_{14}} = 0 \\
&S(x^{3_0}) + y^{3_0} = 0 \\
&S(x^{3_1}) + y^{3_1} = 0 \\
&S(x^{3_6}) + y^{3_6} = 0 \\
&S(x^{3_{10}}) + y^{3_{10}} = 0
\end{aligned}$$

$$S(x^{3_{11}}) + y^{3_{11}} = 0$$

$$S(x^{3_{12}}) + y^{3_{12}} = 0$$

$$S(x^{3_{13}}) + y^{3_{13}} = 0$$

$$S(x^{3_{14}}) + y^{3_{14}} = 0$$

$$S(x^{4_0}) + y^{4_0} = 0$$

$$S(x^{4_1}) + y^{4_1} = 0$$

$$S(x^{4_3}) + y^{4_3} = 0$$

$$S(x^{4_7}) + y^{4_7} = 0$$

$$S(x^{4_{11}}) + y^{4_{11}} = 0$$

$$S(x^{5_8}) + y^{5_8} = 0$$

$$S(x^{5_{12}}) + y^{5_{12}} = 0$$

$$S(x^{5_{13}}) + y^{5_{13}} = 0$$

$$S(x^{5_{15}}) + y^{5_{15}} = 0$$

$$S(x^{6_0}) + y^{6_0} = 0$$

$$S(x^{6_2}) + y^{6_2} = 0$$

$$S(x^{6_3}) + y^{6_3} = 0$$

$$S(x^{6_5}) + y^{6_5} = 0$$

$$S(x^{6_6}) + y^{6_6} = 0$$

$$S(x^{6_9}) + y^{6_9} = 0$$

$$S(x^{6_{12}}) + y^{6_{12}} = 0$$

$$S(x^{6_{15}}) + y^{6_{15}} = 0$$

$$S(x^{7_2}) + y^{7_2} = 0$$

$$S(x^{7_3}) + y^{7_3} = 0$$

$$S(x^{7_4}) + y^{7_4} = 0$$

$$S(x^{7_5}) + y^{7_5} = 0$$

$$S(x^{7_7}) + y^{7_7} = 0$$

$$S(x^{7_{10}}) + y^{7_{10}} = 0$$

$$S(x^{7_{11}}) + y^{7_{11}} = 0$$

$$S(x^{7_{12}}) + y^{7_{12}} = 0$$

$$S(x^{7_{15}}) + y^{7_{15}} = 0$$

$$S(x^{8_2}) + y^{8_2} = 0$$

$$S(x^{8_3}) + y^{8_3} = 0$$

$$S(x^{8_7}) + y^{8_7} = 0$$

$$S(x^{8_8}) + y^{8_8} = 0$$

$$S(x^{8_9}) + y^{8_9} = 0$$

$$S(x^{8_{10}}) + y^{8_{10}} = 0$$

$$S(x^{8_{15}}) + y^{8_{15}} = 0$$

$$S(x^{9_2}) + y^{9_2} = 0$$

$$S(x^{9_8}) + y^{9_8} = 0$$

$$S(x^{9_{15}}) + y^{9_{15}} = 0$$

the 3 th Minimal Constraint set is:

$$y^{0_0} + x^{1_4} + k1_0 + k2_0_0 + k3_0_0 = 0$$

$$y^{0_0} + y^{0_{10}} + x^{1_{12}} + k1_0 + k2_0_0 + k3_0_0 = 0$$

$$y^{0_2} + x^{1_6} + k1_2 + k2_2_0 + k3_2_0 = 0$$

$$\begin{aligned}
&y^{\wedge}0_2 + [y^{\wedge}0_8] + [x^{\wedge}1_14] + k1_2 + k2_2_0 + k3_2_0 = 0 \\
&[y^{\wedge}0_7] + y^{\wedge}0_10 + x^{\wedge}1_8 + k1_7 + k2_7_0 + k3_7_0 = 0 \\
&y^{\wedge}1_1 + x^{\wedge}2_5 + k1_15 + k2_15_0 + k3_15_0 = 0 \\
&y^{\wedge}1_1 + y^{\wedge}1_11 + x^{\wedge}2_13 + k1_15 + k2_15_0 + k3_15_0 = 0 \\
&y^{\wedge}1_2 + x^{\wedge}2_6 + k1_8 + k2_8_0 + k3_8_0 = 0 \\
&y^{\wedge}1_2 + y^{\wedge}1_8 + x^{\wedge}2_14 + k1_8 + k2_8_0 + k3_8_0 = 0 \\
&y^{\wedge}1_3 + y^{\wedge}1_9 + y^{\wedge}1_12 + [x^{\wedge}2_3] + k1_13 + k2_13_0 + k3_13_0 = 0 \\
&y^{\wedge}1_3 + [x^{\wedge}2_7] + k1_13 + k2_13_0 + k3_13_0 = 0 \\
&y^{\wedge}1_4 + y^{\wedge}1_11 + x^{\wedge}2_9 + k1_10 + k2_10_0 + k3_10_0 = 0 \\
&y^{\wedge}1_6 + y^{\wedge}1_9 + x^{\wedge}2_11 + k1_12 + k2_12_0 + k3_12_0 = 0 \\
&y^{\wedge}2_0 + y^{\wedge}2_10 + y^{\wedge}2_13 + x^{\wedge}3_0 + k1_1 + k2_1_1 + k3_1_1 = 0 \\
&y^{\wedge}2_0 + y^{\wedge}2_10 + x^{\wedge}3_12 + k1_1 + k2_1_1 + k3_1_1 = 0 \\
&[y^{\wedge}2_1] + y^{\wedge}2_11 + y^{\wedge}2_14 + x^{\wedge}3_1 + k1_7 + k2_7_1 + k3_7_1 = 0 \\
&y^{\wedge}2_2 + x^{\wedge}3_6 + k1_0 + k2_0_1 + k3_0_1 = 0 \\
&y^{\wedge}2_2 + y^{\wedge}2_8 + x^{\wedge}3_14 + k1_0 + k2_0_1 + k3_0_1 = 0 \\
&y^{\wedge}2_5 + y^{\wedge}2_8 + x^{\wedge}3_10 + k1_6 + k2_6_1 + k3_6_1 = 0 \\
&y^{\wedge}2_6 + y^{\wedge}2_9 + x^{\wedge}3_11 + k1_4 + k2_4_1 + k3_4_1 = 0 \\
&y^{\wedge}3_0 + y^{\wedge}3_10 + x^{\wedge}4_12 + k1_15 + k2_15_1 + k3_15_1 = 0 \\
&y^{\wedge}3_1 + y^{\wedge}3_11 + y^{\wedge}3_14 + x^{\wedge}4_1 + k1_11 + k2_11_1 + k3_11_1 = 0 \\
&[y^{\wedge}3_2] + [y^{\wedge}3_8] + x^{\wedge}4_14 + k1_9 + k2_9_1 + k3_9_1 = 0 \\
&y^{\wedge}3_3 + y^{\wedge}3_9 + y^{\wedge}3_12 + x^{\wedge}4_3 + k1_14 + k2_14_1 + k3_14_1 = 0 \\
&y^{\wedge}3_3 + x^{\wedge}4_7 + k1_14 + k2_14_1 + k3_14_1 = 0 \\
&y^{\wedge}3_6 + y^{\wedge}3_9 + x^{\wedge}4_11 + k1_10 + k2_10_1 + k3_10_1 = 0 \\
&y^{\wedge}4_1 + y^{\wedge}4_11 + y^{\wedge}4_14 + x^{\wedge}5_1 + k1_3 + k2_3_2 + k3_3_2 = 0 \\
&y^{\wedge}4_3 + y^{\wedge}4_9 + y^{\wedge}4_12 + x^{\wedge}5_3 + k1_6 + k2_6_2 + k3_6_2 = 0 \\
&y^{\wedge}4_3 + x^{\wedge}5_7 + k1_6 + k2_6_2 + k3_6_2 = 0 \\
&y^{\wedge}4_3 + y^{\wedge}4_9 + x^{\wedge}5_15 + k1_6 + k2_6_2 + k3_6_2 = 0 \\
&y^{\wedge}4_7 + [y^{\wedge}4_10] + x^{\wedge}5_8 + k1_5 + k2_5_2 + k3_5_2 = 0 \\
&y^{\wedge}5_0 + x^{\wedge}6_4 + k1_11 + k2_11_2 + k3_11_2 = 0 \\
&y^{\wedge}5_0 + y^{\wedge}5_10 + x^{\wedge}6_12 + k1_11 + k2_11_2 + k3_11_2 = 0 \\
&y^{\wedge}5_1 + x^{\wedge}6_5 + k1_13 + k2_13_2 + k3_13_2 = 0 \\
&y^{\wedge}5_2 + y^{\wedge}5_8 + y^{\wedge}5_15 + x^{\wedge}6_2 + k1_15 + k2_15_2 + k3_15_2 = 0 \\
&y^{\wedge}5_2 + x^{\wedge}6_6 + k1_15 + k2_15_2 + k3_15_2 = 0 \\
&y^{\wedge}5_3 + x^{\wedge}6_7 + k1_12 + k2_12_2 + k3_12_2 = 0 \\
&y^{\wedge}5_7 + y^{\wedge}5_10 + x^{\wedge}6_8 + k1_14 + k2_14_2 + k3_14_2 = 0 \\
&y^{\wedge}6_0 + x^{\wedge}7_4 + k1_3 + k2_3_3 + k3_3_3 = 0 \\
&y^{\wedge}6_0 + y^{\wedge}6_10 + x^{\wedge}7_12 + k1_3 + k2_3_3 + k3_3_3 = 0 \\
&[y^{\wedge}6_1] + y^{\wedge}6_11 + x^{\wedge}7_13 + k1_5 + k2_5_3 + k3_5_3 = 0 \\
&y^{\wedge}6_2 + x^{\wedge}7_6 + k1_7 + k2_7_3 + k3_7_3 = 0 \\
&y^{\wedge}6_3 + y^{\wedge}6_9 + y^{\wedge}6_12 + x^{\wedge}7_3 + k1_4 + k2_4_3 + k3_4_3 = 0 \\
&y^{\wedge}6_3 + x^{\wedge}7_7 + k1_4 + k2_4_3 + k3_4_3 = 0 \\
&y^{\wedge}6_4 + y^{\wedge}6_11 + x^{\wedge}7_9 + k1_1 + k2_1_3 + k3_1_3 = 0 \\
&y^{\wedge}6_5 + y^{\wedge}6_8 + x^{\wedge}7_10 + k1_2 + k2_2_3 + k3_2_3 = 0 \\
&y^{\wedge}6_6 + y^{\wedge}6_9 + x^{\wedge}7_11 + k1_0 + k2_0_3 + k3_0_3 = 0
\end{aligned}$$

$$\begin{aligned}
& y^6_7 + y^6_{10} + x^7_8 + k1_6 + k2_{6_3} + k3_{6_3} = 0 \\
& [y^7_0] + y^7_{10} + y^7_{13} + x^8_0 + k1_{13} + k2_{13_3} + k3_{13_3} = 0 \\
& [y^7_0] + x^8_4 + k1_{13} + k2_{13_3} + k3_{13_3} = 0 \\
& [y^7_0] + y^7_{10} + x^8_{12} + k1_{13} + k2_{13_3} + k3_{13_3} = 0 \\
& y^7_2 + x^8_6 + k1_{11} + k2_{11_3} + k3_{11_3} = 0 \\
& y^7_2 + y^7_8 + x^8_{14} + k1_{11} + k2_{11_3} + k3_{11_3} = 0 \\
& y^7_3 + y^7_9 + y^7_{12} + x^8_3 + k1_{10} + k2_{10_3} + k3_{10_3} = 0 \\
& y^7_3 + x^8_7 + k1_{10} + k2_{10_3} + k3_{10_3} = 0 \\
& y^7_3 + y^7_9 + x^8_{15} + k1_{10} + k2_{10_3} + k3_{10_3} = 0 \\
& y^7_4 + y^7_{11} + x^8_9 + k1_{15} + k2_{15_3} + k3_{15_3} = 0 \\
& y^7_6 + y^7_9 + x^8_{11} + k1_9 + k2_{9_3} + k3_{9_3} = 0 \\
& y^7_7 + y^7_{10} + x^8_8 + k1_{12} + k2_{12_3} + k3_{12_3} = 0 \\
& y^8_0 + y^8_{10} + x^9_{12} + k1_5 + k2_{5_4} + k3_{5_4} = 0 \\
& y^8_1 + y^8_{11} + y^8_{14} + x^9_1 + k1_6 + k2_{6_4} + k3_{6_4} = 0 \\
& y^8_1 + y^8_{11} + x^9_{13} + k1_6 + k2_{6_4} + k3_{6_4} = 0 \\
& y^8_2 + y^8_8 + y^8_{15} + x^9_2 + k1_3 + k2_{3_4} + k3_{3_4} = 0 \\
& y^8_2 + x^9_6 + k1_3 + k2_{3_4} + k3_{3_4} = 0 \\
& y^8_3 + y^8_9 + y^8_{12} + x^9_3 + k1_2 + k2_{2_4} + k3_{2_4} = 0 \\
& y^8_3 + x^9_7 + k1_2 + k2_{2_4} + k3_{2_4} = 0 \\
& y^8_3 + y^8_9 + x^9_{15} + k1_2 + k2_{2_4} + k3_{2_4} = 0 \\
& y^8_4 + y^8_{11} + x^9_9 + k1_7 + k2_{7_4} + k3_{7_4} = 0 \\
& y^8_6 + y^8_9 + x^9_{11} + k1_1 + k2_{1_4} + k3_{1_4} = 0 \\
& y^8_7 + y^8_{10} + x^9_8 + k1_4 + k2_{4_4} + k3_{4_4} = 0 \\
& y^9_0 + y^9_{10} + y^9_{13} + x^{10}_0 + k1_{14} + k2_{14_4} + k3_{14_4} = 0 \\
& y^9_0 + x^{10}_4 + k1_{14} + k2_{14_4} + k3_{14_4} = 0 \\
& y^9_1 + y^9_{11} + x^{10}_{13} + k1_{12} + k2_{12_4} + k3_{12_4} = 0 \\
& y^9_2 + y^9_8 + y^9_{15} + [x^{10}_2] + k1_{13} + k2_{13_4} + k3_{13_4} = 0 \\
& y^9_3 + y^9_9 + y^9_{12} + x^{10}_3 + k1_8 + k2_{8_4} + k3_{8_4} = 0 \\
& y^9_3 + x^{10}_7 + k1_8 + k2_{8_4} + k3_{8_4} = 0 \\
& y^9_3 + y^9_9 + x^{10}_{15} + k1_8 + k2_{8_4} + k3_{8_4} = 0 \\
& y^9_6 + y^9_9 + x^{10}_{11} + k1_{15} + k2_{15_4} + k3_{15_4} = 0 \\
& y^9_7 + y^9_{10} + x^{10}_8 + k1_{10} + k2_{10_4} + k3_{10_4} = 0 \\
& y^{10}_0 + y^{10}_{10} + y^{10}_{13} + x^{11}_0 + k1_6 + k2_{6_5} + k3_{6_5} = 0 \\
& [y^{10}_2] + y^{10}_8 + y^{10}_{15} + x^{11}_2 + k1_5 + k2_{5_5} + k3_{5_5} = 0 \\
& [y^{10}_2] + x^{11}_6 + k1_5 + k2_{5_5} + k3_{5_5} = 0 \\
& y^{10}_3 + y^{10}_9 + x^{11}_{15} + k1_0 + k2_{0_5} + k3_{0_5} = 0 \\
& y^{10}_4 + y^{10}_{11} + x^{11}_9 + k1_3 + k2_{3_5} + k3_{3_5} = 0 \\
& [y^{10}_6] + y^{10}_9 + [x^{11}_{11}] + k1_7 + k2_{7_5} + k3_{7_5} = 0 \\
& y^{10}_7 + y^{10}_{10} + x^{11}_8 + k1_2 + k2_{2_5} + k3_{2_5} = 0 \\
& y^{11}_0 + x^{12}_4 + k1_{12} + k2_{12_5} + k3_{12_5} = 0 \\
& y^{11}_2 + y^{11}_8 + y^{11}_{15} + x^{12}_2 + k1_{14} + k2_{14_5} + k3_{14_5} = 0 \\
& y^{11}_6 + y^{11}_9 + x^{12}_{11} + k1_{11} + k2_{11_5} + k3_{11_5} = 0 \\
& y^{12}_2 + x^{13}_6 + k1_6 + k2_{6_6} + k3_{6_6} = 0 \\
& y^{12}_4 + y^{12}_{11} + x^{13}_9 + k1_5 + k2_{5_6} + k3_{5_6} = 0
\end{aligned}$$

$$y^{13}_6 + y^{13}_9 + [x^{14}_{11}] + k_{1_13} + k_{2_13_6} + k_{3_13_6} = 0$$

$$S(x^{1_4}) + y^{1_4} = 0$$

$$S(x^{1_6}) + y^{1_6} = 0$$

$$S(x^{1_8}) + y^{1_8} = 0$$

$$S(x^{1_{12}}) + y^{1_{12}} = 0$$

$$S(x^{2_5}) + y^{2_5} = 0$$

$$S(x^{2_6}) + y^{2_6} = 0$$

$$S(x^{2_9}) + y^{2_9} = 0$$

$$S(x^{2_{11}}) + y^{2_{11}} = 0$$

$$S(x^{2_{13}}) + y^{2_{13}} = 0$$

$$S(x^{2_{14}}) + y^{2_{14}} = 0$$

$$S(x^{3_0}) + y^{3_0} = 0$$

$$S(x^{3_1}) + y^{3_1} = 0$$

$$S(x^{3_6}) + y^{3_6} = 0$$

$$S(x^{3_{10}}) + y^{3_{10}} = 0$$

$$S(x^{3_{11}}) + y^{3_{11}} = 0$$

$$S(x^{3_{12}}) + y^{3_{12}} = 0$$

$$S(x^{3_{14}}) + y^{3_{14}} = 0$$

$$S(x^{4_1}) + y^{4_1} = 0$$

$$S(x^{4_3}) + y^{4_3} = 0$$

$$S(x^{4_7}) + y^{4_7} = 0$$

$$S(x^{4_{11}}) + y^{4_{11}} = 0$$

$$S(x^{4_{12}}) + y^{4_{12}} = 0$$

$$S(x^{4_{14}}) + y^{4_{14}} = 0$$

$$S(x^{5_1}) + y^{5_1} = 0$$

$$S(x^{5_3}) + y^{5_3} = 0$$

$$S(x^{5_7}) + y^{5_7} = 0$$

$$S(x^{5_8}) + y^{5_8} = 0$$

$$S(x^{5_{15}}) + y^{5_{15}} = 0$$

$$S(x^{6_2}) + y^{6_2} = 0$$

$$S(x^{6_4}) + y^{6_4} = 0$$

$$S(x^{6_5}) + y^{6_5} = 0$$

$$S(x^{6_6}) + y^{6_6} = 0$$

$$S(x^{6_7}) + y^{6_7} = 0$$

$$S(x^{6_8}) + y^{6_8} = 0$$

$$S(x^{6_{12}}) + y^{6_{12}} = 0$$

$$S(x^{7_3}) + y^{7_3} = 0$$

$$S(x^{7_4}) + y^{7_4} = 0$$

$$S(x^{7_6}) + y^{7_6} = 0$$

$$S(x^{7_7}) + y^{7_7} = 0$$

$$S(x^{7_8}) + y^{7_8} = 0$$

$$S(x^{7_9}) + y^{7_9} = 0$$

$$S(x^{7_{10}}) + y^{7_{10}} = 0$$

$$S(x^{7_{11}}) + y^{7_{11}} = 0$$

$$\begin{aligned}
S(x^{7_{12}}) + y^{7_{12}} &= 0 \\
S(x^{7_{13}}) + y^{7_{13}} &= 0 \\
S(x^{8_0}) + y^{8_0} &= 0 \\
S(x^{8_3}) + y^{8_3} &= 0 \\
S(x^{8_4}) + y^{8_4} &= 0 \\
S(x^{8_6}) + y^{8_6} &= 0 \\
S(x^{8_7}) + y^{8_7} &= 0 \\
S(x^{8_8}) + y^{8_8} &= 0 \\
S(x^{8_9}) + y^{8_9} &= 0 \\
S(x^{8_{11}}) + y^{8_{11}} &= 0 \\
S(x^{8_{12}}) + y^{8_{12}} &= 0 \\
S(x^{8_{14}}) + y^{8_{14}} &= 0 \\
S(x^{8_{15}}) + y^{8_{15}} &= 0 \\
S(x^{9_1}) + y^{9_1} &= 0 \\
S(x^{9_2}) + y^{9_2} &= 0 \\
S(x^{9_3}) + y^{9_3} &= 0 \\
S(x^{9_6}) + y^{9_6} &= 0 \\
S(x^{9_7}) + y^{9_7} &= 0 \\
S(x^{9_8}) + y^{9_8} &= 0 \\
S(x^{9_9}) + y^{9_9} &= 0 \\
S(x^{9_{11}}) + y^{9_{11}} &= 0 \\
S(x^{9_{12}}) + y^{9_{12}} &= 0 \\
S(x^{9_{13}}) + y^{9_{13}} &= 0 \\
S(x^{9_{15}}) + y^{9_{15}} &= 0 \\
S(x^{10_0}) + y^{10_0} &= 0 \\
S(x^{10_3}) + y^{10_3} &= 0 \\
S(x^{10_4}) + y^{10_4} &= 0 \\
S(x^{10_7}) + y^{10_7} &= 0 \\
S(x^{10_8}) + y^{10_8} &= 0 \\
S(x^{10_{11}}) + y^{10_{11}} &= 0 \\
S(x^{10_{13}}) + y^{10_{13}} &= 0 \\
S(x^{10_{15}}) + y^{10_{15}} &= 0 \\
S(x^{11_0}) + y^{11_0} &= 0 \\
S(x^{11_2}) + y^{11_2} &= 0 \\
S(x^{11_6}) + y^{11_6} &= 0 \\
S(x^{11_8}) + y^{11_8} &= 0 \\
S(x^{11_9}) + y^{11_9} &= 0 \\
S(x^{11_{15}}) + y^{11_{15}} &= 0 \\
S(x^{12_2}) + y^{12_2} &= 0 \\
S(x^{12_4}) + y^{12_4} &= 0 \\
S(x^{12_{11}}) + y^{12_{11}} &= 0 \\
S(x^{13_6}) + y^{13_6} &= 0 \\
S(x^{13_9}) + y^{13_9} &= 0
\end{aligned}$$

the 4 th Minimal Constraint set is:

$$\begin{aligned}
&y^{0_2} + [y^{0_8}] + [y^{0_{15}}] + x^{1_2} + k_{1_2} + k_{2_2_0} + k_{3_2_0} = 0 \\
&y^{0_2} + x^{1_6} + k_{1_2} + k_{2_2_0} + k_{3_2_0} = 0 \\
&y^{1_1} + y^{1_{11}} + [y^{1_{14}}] + [x^{2_1}] + k_{1_{15}} + k_{2_{15_0}} + k_{3_{15_0}} = 0 \\
&y^{1_1} + y^{1_{11}} + x^{2_{13}} + k_{1_{15}} + k_{2_{15_0}} + k_{3_{15_0}} = 0 \\
&y^{1_2} + x^{2_6} + k_{1_8} + k_{2_8_0} + k_{3_8_0} = 0 \\
&y^{1_3} + [x^{2_7}] + k_{1_{13}} + k_{2_{13_0}} + k_{3_{13_0}} = 0 \\
&y^{1_3} + y^{1_9} + [x^{2_{15}}] + k_{1_{13}} + k_{2_{13_0}} + k_{3_{13_0}} = 0 \\
&y^{1_6} + y^{1_9} + x^{2_{11}} + k_{1_{12}} + k_{2_{12_0}} + k_{3_{12_0}} = 0 \\
&y^{2_0} + y^{2_{10}} + y^{2_{13}} + x^{3_0} + k_{1_1} + k_{2_{1_1}} + k_{3_{1_1}} = 0 \\
&y^{2_0} + x^{3_4} + k_{1_1} + k_{2_{1_1}} + k_{3_{1_1}} = 0 \\
&[y^{2_1}] + y^{2_{11}} + x^{3_{13}} + k_{1_7} + k_{2_{7_1}} + k_{3_{7_1}} = 0 \\
&[y^{2_3}] + x^{3_7} + k_{1_5} + k_{2_{5_1}} + k_{3_{5_1}} = 0 \\
&[y^{2_3}] + y^{2_9} + x^{3_{15}} + k_{1_5} + k_{2_{5_1}} + k_{3_{5_1}} = 0 \\
&y^{2_6} + y^{2_9} + x^{3_{11}} + k_{1_4} + k_{2_{4_1}} + k_{3_{4_1}} = 0 \\
&[y^{2_7}] + y^{2_{10}} + [x^{3_8}] + k_{1_3} + k_{2_{3_1}} + k_{3_{3_1}} = 0 \\
&y^{3_0} + y^{3_{10}} + y^{3_{13}} + x^{4_0} + k_{1_{15}} + k_{2_{15_1}} + k_{3_{15_1}} = 0 \\
&[y^{3_2}] + [y^{3_8}] + y^{3_{15}} + x^{4_2} + k_{1_9} + k_{2_{9_1}} + k_{3_{9_1}} = 0 \\
&y^{3_4} + y^{3_{11}} + x^{4_9} + k_{1_8} + k_{2_{8_1}} + k_{3_{8_1}} = 0 \\
&y^{3_7} + y^{3_{10}} + x^{4_8} + k_{1_{13}} + k_{2_{13_1}} + k_{3_{13_1}} = 0 \\
&y^{4_0} + [x^{5_4}] + k_{1_7} + k_{2_{7_2}} + k_{3_{7_2}} = 0 \\
&y^{4_2} + y^{4_8} + x^{5_{14}} + k_{1_1} + k_{2_{1_2}} + k_{3_{1_2}} = 0 \\
&[y^{4_6}] + y^{4_9} + [x^{5_{11}}] + k_{1_2} + k_{2_{2_2}} + k_{3_{2_2}} = 0 \\
&y^{5_1} + [y^{5_{11}}] + y^{5_{14}} + [x^{6_1}] + k_{1_{13}} + k_{2_{13_2}} + k_{3_{13_2}} = 0 \\
&y^{5_1} + [y^{5_{11}}] + [x^{6_{13}}] + k_{1_{13}} + k_{2_{13_2}} + k_{3_{13_2}} = 0 \\
&S(x^{1_2}) + y^{1_2} = 0 \\
&S(x^{1_6}) + y^{1_6} = 0 \\
&S(x^{2_6}) + y^{2_6} = 0 \\
&S(x^{2_{11}}) + y^{2_{11}} = 0 \\
&S(x^{2_{13}}) + y^{2_{13}} = 0 \\
&S(x^{3_0}) + y^{3_0} = 0 \\
&S(x^{3_4}) + y^{3_4} = 0 \\
&S(x^{3_7}) + y^{3_7} = 0 \\
&S(x^{3_{11}}) + y^{3_{11}} = 0 \\
&S(x^{3_{13}}) + y^{3_{13}} = 0 \\
&S(x^{3_{15}}) + y^{3_{15}} = 0 \\
&S(x^{4_0}) + y^{4_0} = 0 \\
&S(x^{4_2}) + y^{4_2} = 0 \\
&S(x^{4_8}) + y^{4_8} = 0 \\
&S(x^{4_9}) + y^{4_9} = 0 \\
&S(x^{5_{14}}) + y^{5_{14}} = 0
\end{aligned}$$

the 5 th Minimal Constraint set is:

$$\begin{aligned}
&[y^{2_1}] + x^{3_5} + k_{1_7} + k_{2_{7_1}} + k_{3_{7_1}} = 0 \\
&y^{3_5} + [y^{3_8}] + [x^{4_{10}}] + k_{1_{12}} + k_{2_{12_1}} + k_{3_{12_1}} = 0 \\
&S(x^{3_5}) + y^{3_5} = 0
\end{aligned}$$

the 6 th Minimal Constraint set is:

$$[y^{3_2}] + [x^{4_6}] + k_{1_9} + k_{2_9_1} + k_{3_9_1} = 0$$

the 7 th Minimal Constraint set is:

$$[y^{11_1}] + [x^{12_5}] + k_{1_{10}} + k_{2_{10_5}} + k_{3_{10_5}} = 0$$