Now we consider a bilevel programming with three followers in which the leader has a decision vector \((x_1, x_2, x_3)\) and the three followers have decision vectors \((y_{i1}, y_{i2}), \; i = 1, 2, 3,\)

\[
\begin{align*}
\max_{x_1, x_2, x_3} & \quad y_{11}^* y_{12}^* \sin x_1 + 2 y_{21}^* y_{22}^* \sin x_2 + 3 y_{31}^* y_{32}^* \sin x_3 \\
\text{subject to:} & \quad x_1 + x_2 + x_3 \leq 10, \; x_1 \geq 0, \; x_2 \geq 0, \; x_3 \geq 0 \\
& \quad (y_{11}^*, y_{12}^*, y_{21}^*, y_{22}^*, y_{31}^*, y_{32}^*) \text{ solves the problems}
\end{align*}
\]

\[
\begin{align*}
\max_{y_{11}, y_{12}} & \quad y_{11} \sin y_{12} + y_{12} \sin y_{11} \\
\text{subject to:} & \quad y_{11} + y_{12} \leq x_1, \; y_{11} \geq 0, \; y_{12} \geq 0
\end{align*}
\]

\[
\begin{align*}
\max_{y_{21}, y_{22}} & \quad y_{21} \sin y_{22} + y_{22} \sin y_{21} \\
\text{subject to:} & \quad y_{21} + y_{22} \leq x_2, \; y_{21} \geq 0, \; y_{22} \geq 0
\end{align*}
\]

\[
\begin{align*}
\max_{y_{31}, y_{32}} & \quad y_{31} \sin y_{32} + y_{32} \sin y_{31} \\
\text{subject to:} & \quad y_{31} + y_{32} \leq x_3, \; y_{31} \geq 0, \; y_{32} \geq 0.
\end{align*}
\]

A run of GA with 1000 generations shows that the Stackelberg-Nash equilibrium is

\[
(x_1^*, x_2^*, x_3^*) = (0.000, 1.936, 8.064),
\]

\[
(y_{11}^*, y_{12}^*) = (0.000, 0.000),
\]

\[
(y_{21}^*, y_{22}^*) = (0.968, 0.968),
\]

\[
(y_{31}^*, y_{32}^*) = (1.317, 6.747)
\]

with optimal objective values

\[
\begin{align*}
y_{11}^* y_{12}^* \sin x_1^* + 2 y_{21}^* y_{22}^* \sin x_2^* + 3 y_{31}^* y_{32}^* \sin x_3^* &= 27.822, \\
y_{11}^* \sin y_{12}^* + y_{12}^* \sin y_{11}^* &= 0.000, \\
y_{21}^* \sin y_{22}^* + y_{22}^* \sin y_{21}^* &= 1.595, \\
y_{31}^* \sin y_{32}^* + y_{32}^* \sin y_{31}^* &= 7.120.
\end{align*}
\]