Putting it all Together:

Recursive equations:
$a = \perp$
$b = f_{x=1}$
$c = b$
$d = f_{x=0}$
$e = d \sqcup f$
$f = f_{swap}$

Transfer functions:
$f_{x=1}(l) = +$
$f_{x=0}(l) = 0$
$f = f_{swap}(l) =$

Monotone Functions and Fixed-Points:

i)

$$\begin{aligned} X &= \{a,\ b\} \\ Y &= X \cup Y \end{aligned}$$

In equation form:

$$\begin{aligned} X &= f(X, Y) &= \{a,\ b\} \\ Y &= g(X, Y) &= X \cup Y \end{aligned}$$

Can be written as:

$$\begin{aligned} X &= f() &= \{a,\ b\} \\ Y &= g(X, Y) &= X \cup Y \end{aligned}$$

Monotonicity

The function $f()$ is monotone, as it is constant. Therefore $f() \sqsubseteq f()$ will always hold. The function $g(X,\ Y)$ is also monotone, as no matter which sets use give the function it will combine them and the resulting set will always be greater or equal to the input sets.

ii)

$$\begin{aligned} X &= \{a,\ b\} \cup Y \\ Y &= X \setminus \{b\} \end{aligned}$$

In equation form:

$$\begin{aligned} X &= f(X, Y) &= \{a,\ b\} \cup Y \\ Y &= g(X, Y) &= X \setminus \{b\} \end{aligned}$$

Can be written as:

$$\begin{aligned} X &= f(Y) &= \{a,\ b\} \cup Y \\ Y &= g(X) &= X \setminus \{b\} \end{aligned}$$

The function $f(Y)$ is monotone, as it return $\{a,\ b\} \cup Y$ which is always a superset of Y. The function $g(X)$ is also monotone. It is hard to give an example of why, however intuitively removing a constant element preserves monotonicity, as the same element is removed on both sides of $\sqsubseteq$.

iii)

$$X = \{a,\ b\} \cup Z$$
$$Y = \{a,\ c\} \setminus X$$
$$Z = X^C$$

In equation form:

$$X = f(X,\ Y,\ Z) = \{a,\ b\} \cup Z$$
$$Y = g(X,\ Y,\ Z) = \{a,\ c\} \setminus X$$
$$Z = h(X,\ Y,\ Z) = X^C$$

Can be written as:

$$X = f(Z) = \{a,\ b\} \cup Z$$
$$Y = g(X) = \{a,\ c\} \setminus X$$
$$Z = h(X) = X^C$$

The function $f(Z)$ is monotone, as it return $\{a,\ b\} \cup Z$ which is always a superset of Z. If $g(X)$ is monotone then $\forall\, Y,\ Y'\ P(\{a,\ b,\ c\}) :$ $Y\ \sqsubseteq\ Y'$. However this is not the case:

$$\emptyset \sqsubseteq \{a,\ b,\ c\}$$
$$g(\emptyset) \not\sqsubseteq g(\{a,\ b,\ c\})$$
$$\{a,\ c\} \not\sqsubseteq \emptyset$$

$g(X)$ is therefore not monotone. $h(X)$ is not monotone either, as:

$$\emptyset \sqsubseteq \{a,\ b,\ c\}$$
$$g(\emptyset) \not\sqsubseteq g(\{a,\ b,\ c\})$$
$$\{a,\ b\ c\} \not\sqsubseteq \emptyset$$