Problem Wk.3.3.4: Representations

Derive the operator equation and difference equation for each of the LTI systems given by the block diagrams below.

A difference equation is in the form:

\[ y[n] = c_0 y[n-1] + c_1 y[n-2] + \ldots + c_{k-1} y[n-k] + d_0 x[n] + d_1 x[n-1] + \ldots + d_j x[n-j] \]

To specify difference equations, enter sequences of coefficients for the \( y \) terms and a separate sequence of coefficients for the \( x \) terms. **Do not enter any commas, just numbers separated by spaces.** Specify the \( d \)Coeffs: \( d_0 \ldots d_j \) and the \( c \)Coeffs: \( c_0 \ldots c_{k-1} \) for each of the difference equations below. For each question, enter a sequence of numbers representing the coefficients.

If one set of coefficients is empty, enter **none**, otherwise enter a sequence of numbers separated by spaces (no commas, parens, brackets, etc).

**Operator equation:** The equation is expressed as:

\[ a_0 y + a_1 R_y + a_2 R_y^2 + \ldots = b_0 x + b_1 R_x + \ldots \]

The first entry in the sequence of \( R_y \) coefficients is for the constant term \( (R_y^0 y) \), then for the \( R_y \) term \( (R_y^1 y) \), then for the \( R_y^2 \) term, and so on. Same for the \( R_x \) coefficients, start with the \( R_x^0 \) term.

If one set of coefficients is empty, enter **none**, otherwise enter a sequence of numbers separated by spaces (no commas, parens, brackets, etc).

1.

![Block Diagram 1](image)

**Difference equation:**

dCoeffs: [ ] cCoeffs: [ ]

**Operator equation:**

Rx coeffs: [ ] Ry coeffs: [ ]

2.

![Block Diagram 2](image)

**Difference equation:**

dCoeffs (input): [ ] cCoeffs (output): [ ]
Operator equation:
Rx coeffs: __________  Ry coeffs: __________