Mechanical Translation Example 1
Mechanical Translation Example 2
Mechanical Rotation Example 1
Mechanical Rotation Example 2
Challenge Problem: Wind Turbine Bond Graph Synthesis
Electrical Circuits Example 1
Electrical Circuits Example 2
Electrical Circuits Example 3
Hydraulic Circuit
Example 1

Q → [C₁] → [R₁] → [C₂] → [I₁] → [R₂] → (a)
Hydraulic Circuit Example 2
Mixed System Example
MECE 3304 System Dynamics
Chapter 3 Lecture Problems: Synthesize the bond graph for the following problems.

Practice Problem 1

![Bond Graph Diagram]

\[
x_1(t) \quad b \quad x_2(t) \quad F(t)
\]

- \( m \) denotes mass
- \( k \) denotes spring constant
- \( b \) denotes damping coefficient
Chapter 3 Lecture Problems: Synthesize the bond graph for the following problems.

Practice Problem 2
Chapter 3 Lecture Problems: Synthesize the bond graph for the following problems.

Practice Problem 3
Practice Problem 4
Chapter 3 Lecture Problems: Synthesize the bond graph and derive the differential equations for the following problems.

Mass-Spring-Damper Example
MECE 3304 System Dynamics
Chapter 3 Lecture Problems: Synthesize the bond graph and derive the differential equations for the following problems.

Mechanical Rotation Example
Chapter 3 Lecture Problems: Synthesize the bond graph and derive the differential equations for the following problems.

Electric Circuit Example
Chapter 3 Lecture Problems: Synthesize the bond graph and derive the differential equations for the following problems.

Hydraulic Circuit Example
MECE 3304 System Dynamics
Chapter 3 Lecture Problems: Synthesize the bond graph and derive the differential equations for the following problems.

Mixed System Example
MECE 3304 System Dynamics

Chapter 3 Lecture Problems: Synthesize the bond graph and derive the differential equations for the following problems.

Algebraic Loops
Challenge Problem

**Bond Graph and Differential Equations**

Consider the bond graph shown above. Synthesize the bond graph and derive the differential equations for the following problems.

- **Accumulator** with capacity $C_{acc}$
- **Pipe** with resistance $R_{pipe}$ and flow rate $I_{pipe}$
- **Motor** with moment of inertia $J_m$, resistance $R_m$, inductance $L_m$, and overall force $F_m$ (which is a function of $N_1$ and $N_2$)
- **Generator** with moment of inertia $J_g$, resistance $R_g$, and voltage $v(t)$

Use the bond graph symbols and conventions to model the system dynamics.