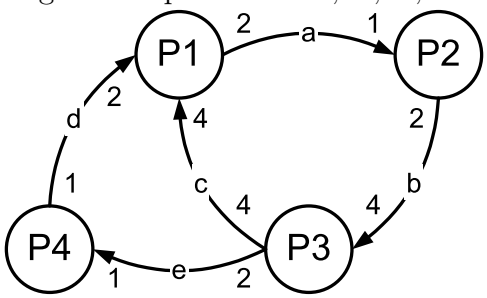
Homework 02

ECE 587, Spring 2025

Due Date: 03/09 (Sun.) by the end of the day (Chicago time)

1. *(2 points)*

   Consider the computation specified by the following Synchronous Data Flow (SDF) model consisting of four processes `P1`,`P2`,`P3`,`P4` and five channels `a`,`b`,`c`,`d`,`e`.



   1) Determine the relative execution rates of the four processes.
   2) Schedule the processes according to the rates computed in 1) (there are many possible schedules and you are free to pick any one). Compute the number of initial tokens required on each channel and the queue size of each channel according to your scheduling.

2. *(1 point)*

   Read the following sequential program that and model one loop iteration by a Data Flow Graph (DFG).

```
double a = ..., b = ..., c = ..., d = ...;
for (...) {
  double s=a+b;
  double t=a-b;
  a=s;
  b=t;
  s=c*d+a;
  t=c/d-b;
  c=s;
  d=t;
}
```

3. *(2 points)*

   Once upon a time a farmer went to a market and purchased a fox, a goose, and a bag of beans. On his way home, the farmer came to the bank of a river and rented a boat. But crossing the river by boat, the farmer could carry only himself and a single one of his purchases: the fox, the goose, or the bag of beans.

   If left unattended together, the fox would eat the goose, or the goose would eat the beans. Will the farmer be able to carry himself and his purchases to the far bank of the river, leaving each purchase intact?

   While you may easily find the answer to this problem online, we are interested in a method that solves this and similar river crossing puzzles. Show that you can model the problem with a FSM and then apply model checking concepts to solve it.