Homework 03

ECE 587, Spring 2025

Due Date: 03/30 (Sun.) by the end of the day (Chicago time)

Consider the following sequential program that should be implemented as a hardware component.

```
inputs/outputs: u,w,y,dx,i
temporary variables: u1,u2,u3,u4,u5,u6,y1

u1 =  u*dx;
u2 =  5*w;
u3 =  3*y;
y1 =  i*dx;
w  =  w+dx;
u4 = u1*u2;
u5 = dx*u3;
y  =  y+y1;
u6 =  u-u4;
u  = u6-u5;
```

1. *(2 points)* Assume each multiplication takes 4 clock cycles and each addition or subtraction takes 1 clock cycle. Compute the ASAP schedule to determine the minimum execution time. Compute the ALAP schedule based on the minimum execution time.

2. *(2 points)* Assume there are one 2-input multiplier, which is pipelined into 4 stages, and one 2-input adder/subtractor, which is not pipelined. Perform a resource-constrained scheduling using the mobility computed from the results of *1.*

3. *(1 point)* Determine variable lifetimes and bind variables to as few registers as possible. (Note: you don't need to consider connection cost.)