

# Homework 03

## ECE 587, Spring 2026

*Due Date: 04/26 (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.)