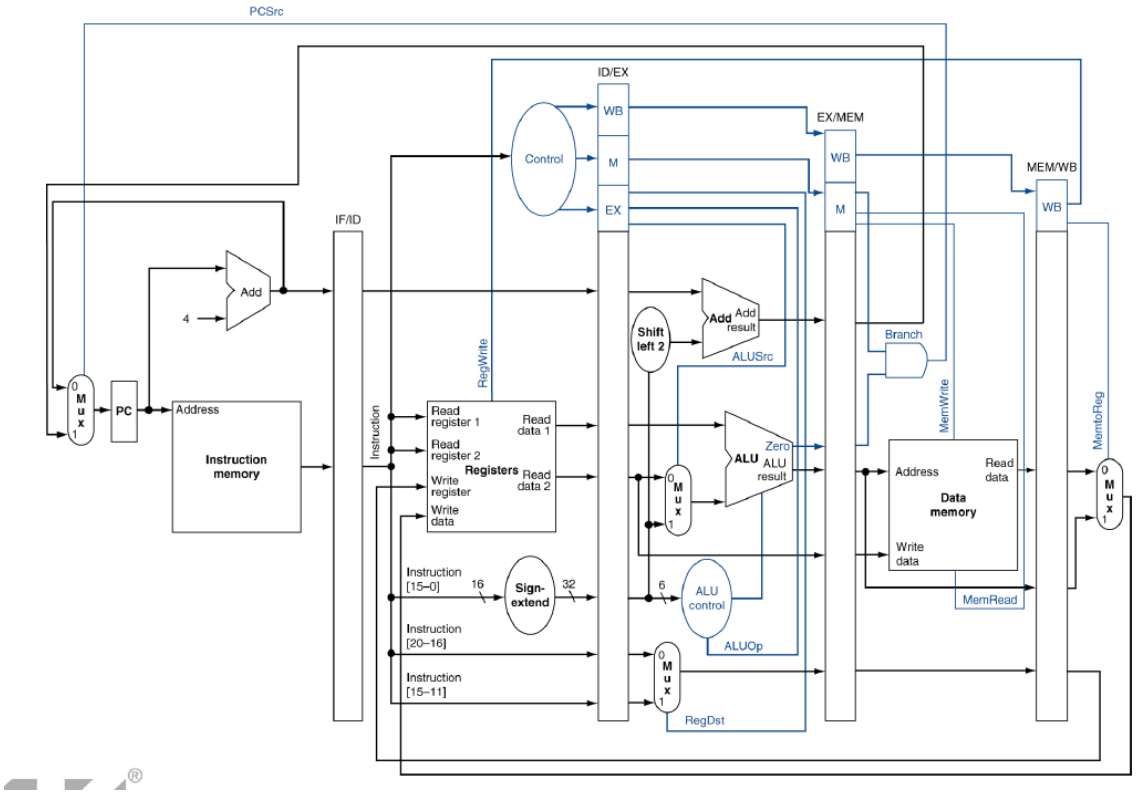
Hazard Free Assembly

Due Date May 26 2019 (Each late day 10pts)

In this project you will write a program that:

- takes a MIPS assembly program as input
- computes the hazard graph
- then inserts minimum number of nops to avoid all data and control hazards.

Assume that you have a pipelined processor without any forwarding and hazard detection unit. The following datapath is assumed:



BONUS:

1. Print dependency graph as a visual graph.(20pts)

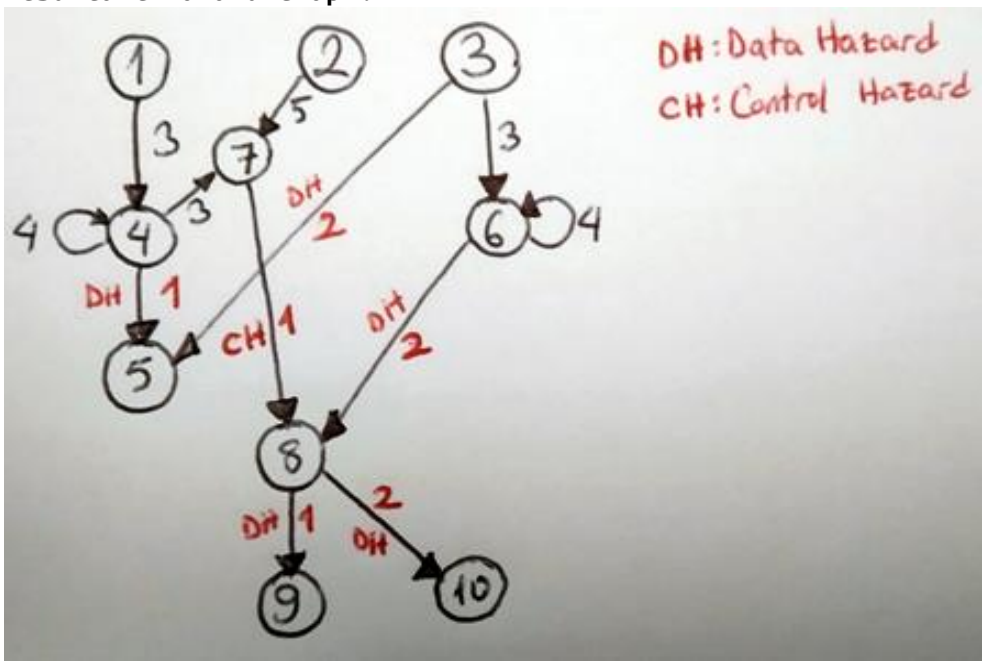
2. Compute the execution time for the pipelined CPU at 4GHz. (20pts)

Example Execution:

Input Assembly:

1		addi $t0, $zero, -1
2		addi $t1, $zero, 0x04AA
3		add $s0, $zero, $gp
4	portakal:	addi $t0, $t0, 1
5		sw $t0, 0($s0)
6		addi $s0, $s0, 4
7		bne $t0, $t1, portakal
8		add $s2, $s0, $gp
9		ori $s3, $s2, 0x0077
10		addi $s1, $s2, 0

Resultant Hazard Graph:



Resultant hazard free assembly of The Algorithm

1		addi $t0, $zero, -1
2		addi $t1, $zero, 0x04AA
3		add $s0, $zero, $gp
4	portakal:	addi $t0, $t0, 1
5		nop
6		nop
7		sw $t0, 0($s0)
8		addi $s0, $s0, 4
9		bne $t0, $t1, portakal
10		nop
11		nop
12		nop
13		add $s2, $s0, $gp
14		nop
15		nop
16		ori $s3, $s2, 0x0077
17		addi $s1, $s2, 0