

Name: _____ Grade: _____

Partial credit for incorrect answers can be earned only if you show your work. Errors on multiple part questions will be carried though your answer only if work is provided.

1. Unroll the given loop two times – your code should perform the equivalent of two loop iterations. Schedule it to minimize the number of both stall cycles and instructions executed; note which loop (A, B, or any combination thereof) each instruction corresponds to. You may assume the loop will be executed an even number of times and that there are sufficient operational units for all instructions. Registers F2, F4, and F6 are constants set prior to the loop. Register R1 is a variable set prior to the loop. Use the table below for latencies. Don't forget to indicate the locations of the stalls. (6 points)

Code:		FP Latencies:	
9 10 11 12 13 14 15 16 17 0 1 2 3 4 5 6 7 8		Constants	
LOOP:	L.D F5, 0(R1)	Producer of result	Consumer of result Latency
3	ADD.D F8, F5, F2	FP ALU op	FP ALU op 3
3	DIV.D F7, F4, F5	FP ALU op	Store double 2
3	MUL.D F3, F8, F6	Load double	FP ALU op 1
3	ADD.D F0, F7, F3	Load double	Store double 0
0	S.D F0, 16(R1)		
2	DADDUI R1, #32		
1	BNE R1, R0, LOOP	Branch delay slots:	1

Loop: L.D F5, 0(R1)
L.D F9, -32(R1)
ADD.D F8, F5, F2
ADD.D F12, F9, F2
DIV.D F7, F4, F5
DIV.D F11, F4, F9
MUL.D F3, F8, F6
MUL.D F10, F12, F6
Stall
Stall
ADD.D F0, F7, F3
ADD.D F9, F11, F10
DADDUI R1, #64
S.D F0, 16(R1)
BNE R1, R0, LOOP
S.D F9, -16(R1)

2. Complete the dependency graph for the following code. Points will be deducted for missing dependencies, extra dependencies, and incorrect notation. (4 points)

Code:
L1: ADD.D F2, F4, F6
L2: MUL.D F6, F8, F2
L3: SUB.D F8, F6, F10
L4: DIV.D F6, F8, F6

Date:
(1,2) (2,3) (2,4) (3,4)
Output:
(2,4)
Anti:
(1,2) (2,3) (3,4)

