HW2 – Solution for Q2

Cycle 1

Instruction Status Iter 1

Instructions		Issue	Exec Comp	Write Result
LD	F0, 0(R1)	1		
DIVD	F2, F0, F6			
LD	F6, 8(R1)			
DIVD	F6, F6, F2			
SD	F6, 16(R1)			
DADDI	R1, R1, #-32			
BNEQZ	R1, LOOP			

Instruction Status Iter 2

Issue	Exec Comp	Write Result

Register Result Status

Reg	F0	F2	F6	R1
Funct Unit:	Ld1			

CDB	FU

Reservation Stations

Time (until complete)	Name	Busy	Op	S1 Vj	S2 Vk	RS Qj	RS Qk
	Add1						
	Add2						
	Mult1						
	Mult2						
	Mult3						
	Mult4						

LD/SD Buffers

Time (until complete)	Name	Busy	Addr	Fu
2	Ld1	Yes	0+R1	
	Ld2			
	Sd1			
	Sd2			

Cycle 2

Instruction Status Iter 1

Instructions		Issue	Exec Comp	Write Result
LD	F0, 0(R1)	1	2-	
DIVD	F2, F0, F6	2		
LD	F6, 8(R1)			
DIVD	F6, F6, F2			
SD	F6, 16(R1)			
DADDI	R1, R1, #-32			
BNEQZ	R1, LOOP			

Instruction Status Iter 2

Issue	Exec Comp	Write Result

Register Result Status

Reg	F0	F2	F6	R1
Funct Unit:	Ld1	Mult1		

CDB	FU

Reservation Stations

Time (until complete)	Name	Busy	Op	S1 Vj	S2 Vk	RS Qj	RS Qk
	Add1						
	Add2						
	Mult1	Yes	DIVD		R(F6)	Ld1	
	Mult2						
	Mult3						
	Mult4						

LD/SD Buffers

Time (until complete)	Name	Busy	Addr	Fu
1	Ld1	Yes	0+R1	
	Ld2			
	Sd1			
	Sd2			

Cycle 3

Instruction Status Iter 1

Instructions		Issue	Exec Comp	Write Result
LD	F0, 0(R1)	1	2-3	
DIVD	F2, F0, F6	2		
LD	F6, 8(R1)	3		
DIVD	F6, F6, F2			
SD	F6, 16(R1)			
DADDI	R1, R1, #-32			
BNEQZ	R1, LOOP			

Instruction Status Iter 2

Issue	Exec Comp	Write Result

Register Result Status

Reg	F0	F2	F6	R1
Funct Unit:	Ld1	Mult1	Ld2	

CDB	FU

Reservation Stations

Time (until complete)	Name	Busy	Op	S1 Vj	S2 Vk	RS Qj	RS Qk
	Add1						
	Add2						
	Mult1	Yes	DIVD		R(F6)	Ld1	
	Mult2						
	Mult3						
	Mult4						

LD/SD Buffers

Time (until complete)	Name	Busy	Addr	Fu
0	Ld1	Yes	0+R1	
2	Ld2	Yes	8+R1	
	Sd1			
	Sd2			

Cycle 4

Instruction Status Iter 1

Instructions		Issue	Exec Comp	Write Result
LD	F0, 0(R1)	1	2-3	4
DIVD	F2, F0, F6	2		
LD	F6, 8(R1)	3	4-	
DIVD	F6, F6, F2	4		
SD	F6, 16(R1)			
DADDI	R1, R1, #-32			
BNEQZ	R1, LOOP			

Instruction Status Iter 2

Issue	Exec Comp	Write Result

Register Result Status

Reg	F0	F2	F6	R1
Funct Unit:	M(A1)	Mult1	Mult2	

CDB	FU
	Ld1

Reservation Stations

Time (until complete)	Name	Busy	Op	S1 Vj	S2 Vk	RS Qj	RS Qk
	Add1						
	Add2						
15	Mult1	Yes	DIVD	M(A1)	R(F6)		
	Mult2	Yes	DIVD			Ld2	Mult1
	Mult3						
	Mult4						

LD/SD Buffers

Time (until complete)	Name	Busy	Addr	Fu
	Ld1			
1	Ld2	Yes	8+R1	
	Sd1			
	Sd2			

Cycle 5

Instruction Status Iter 1

Instructions		Issue	Exec Comp	Write Result
LD	F0, 0(R1)	1	2-3	4
DIVD	F2, F0, F6	2	5-	
LD	F6, 8(R1)	3	4-5	
DIVD	F6, F6, F2	4		
SD	F6, 16(R1)	5		
DADDI	R1, R1, #-32			
BNEQZ	R1, LOOP			

Instruction Status Iter 2

Issue	Exec Comp	Write Result

Register Result Status

Reg	F0	F2	F6	R1
Funct Unit:	M(A1)	Mult1	Mult2	

CDB	FU

Reservation Stations

Time (until complete)	Name	Busy	Op	S1 Vj	S2 Vk	RS Qj	RS Qk
	Add1						
	Add2						
14	Mult1	Yes	DIVD	M(A1)	R(F6)		
	Mult2	Yes	DIVD			Ld2	Mult1
	Mult3						
	Mult4						

LD/SD Buffers

Time (until complete)	Name	Busy	Addr	Fu
	Ld1			
0	Ld2	Yes	8+R1	
	Sd1	Yes	16(R1)	Mult2
	Sd2			

Cycle 6

Instruction Status Iter 1

Instructions		Issue	Exec Comp	Write Result
LD	F0, 0(R1)	1	2-3	4
DIVD	F2, F0, F6	2	5-	
LD	F6, 8(R1)	3	4-5	6
DIVD	F6, F6, F2	4		
SD	F6, 16(R1)	5		
DADDI	R1, R1, #-32	6		
BNEQZ	R1, LOOP			

Instruction Status Iter 2

Issue	Exec Comp	Write Result

Register Result Status

Reg	F0	F2	F6	R1
Funct Unit:	M(A1)	Mult1	Mult2	Add1

CDB	FU
	Ld2

Reservation Stations

Time (until complete)	Name	Busy	Op	S1 Vj	S2 Vk	RS Qj	RS Qk
1	Add1	Yes	DADDI	R1	-32		
	Add2						
13	Mult1	Yes	DIVD	M(A1)	R(F6)		
	Mult2	Yes	DIVD	M(A2)			Mult1
	Mult3						
	Mult4						

LD/SD Buffers

Time (until complete)	Name	Busy	Addr	Fu
	Ld1			
	Ld2			
	Sd1	Yes	16(R1)	Mult2
	Sd2			

Cycle 7

Instruction Status Iter 1

Instructions		Issue	Exec Comp	Write Result
LD	F0, 0(R1)	1	2-3	4
DIVD	F2, F0, F6	2	5-	
LD	F6, 8(R1)	3	4-5	6
DIVD	F6, F6, F2	4		
SD	F6, 16(R1)	5		
DADDI	R1, R1, #-32	6	7	
BNEQZ	R1, LOOP	7		

Instruction Status Iter 2

Issue	Exec Comp	Write Result

Register Result Status

Reg	F0	F2	F6	R1
Funct Unit:	M(A1)	Mult1	Mult2	Add1

CDB	FU

Reservation Stations

Time (until complete)	Name	Busy	Op	S1 Vj	S2 Vk	RS Qj	RS Qk
0	Add1	Yes	DADDI	R1	-32		
	Add2	Yes	BNEQZ		0	Add1	
12	Mult1	Yes	DIVD	M(A1)	R(F6)		
	Mult2	Yes	DIVD	M(A2)			Mult1
	Mult3						
	Mult4						

LD/SD Buffers

Time (until complete)	Name	Busy	Addr	Fu
	Ld1			
	Ld2			
	Sd1	Yes	16(R1)	Mult2
	Sd2			

Cycle 8

Instruction Status Iter 1

Instructions		Issue	Exec Comp	Write Result
LD	F0, 0(R1)	1	2-3	4
DIVD	F2, F0, F6	2	5-	
LD	F6, 8(R1)	3	4-5	6
DIVD	F6, F6, F2	4		
SD	F6, 16(R1)	5		
DADDI	R1, R1, #-32	6	7	8
BNEQZ	R1, LOOP	7		

Instruction Status Iter 2

Issue	Exec Comp	Write Result

Register Result Status

Reg	F0	F2	F6	R1
Funct Unit:	M(A1)	Mult1	Mult2	

CDB	FU
	Add1

Reservation Stations

Time (until complete)	Name	Busy	Op	S1 Vj	S2 Vk	RS Qj	RS Qk
	Add1						
1	Add2	Yes	BNEQZ	R1	0		
11	Mult1	Yes	DIVD	M(A1)	R(F6)		
	Mult2	Yes	DIVD	M(A2)			Mult1
	Mult3						
	Mult4						

LD/SD Buffers

Time (until complete)	Name	Busy	Addr	Fu
	Ld1			
	Ld2			
	Sd1	Yes	16(R1)	Mult2
	Sd2			

Cycle 9

Instruction Status Iter 1

Instructions		Issue	Exec Comp	Write Result
LD	F0, 0(R1)	1	2-3	4
DIVD	F2, F0, F6	2	5-	
LD	F6, 8(R1)	3	4-5	6
DIVD	F6, F6, F2	4		
SD	F6, 16(R1)	5		
DADDI	R1, R1, #-32	6	7	8
BNEQZ	R1, LOOP	7	9	

Instruction Status Iter 2

Issue	Exec Comp	Write Result

Register Result Status

Reg	F0	F2	F6	R1
Funct Unit:	M(A1)	Mult1	Mult2	

CDB	FU

Reservation Stations

Time (until complete)	Name	Busy	Op	S1 Vj	S2 Vk	RS Qj	RS Qk
	Add1						
0	Add2	Yes	BNEQZ	R1	0		
10	Mult1	Yes	DIVD	M(A1)	R(F6)		
	Mult2	Yes	DIVD	M(A2)			Mult1
	Mult3						
	Mult4						

LD/SD Buffers

Time (until complete)	Name	Busy	Addr	Fu
	Ld1			
	Ld2			
	Sd1	Yes	16(R1)	Mult2
	Sd2			

Cycle 10

Instruction Status Iter 1

Instructions		Issue	Exec Comp	Write Result
LD	F0, 0(R1)	1	2-3	4
DIVD	F2, F0, F6	2	5-	
LD	F6, 8(R1)	3	4-5	6
DIVD	F6, F6, F2	4		
SD	F6, 16(R1)	5		
DADDI	R1, R1, #-32	6	7	8
BNEQZ	R1, LOOP	7	9	10

Instruction Status Iter 2

Issue	Exec Comp	Write Result
10		

Register Result Status

Reg	F0	F2	F6	R1
Funct Unit:	Ld1	Mult1	Mult2	

CDB	FU

Reservation Stations

Time (until complete)	Name	Busy	Op	S1 Vj	S2 Vk	RS Qj	RS Qk
	Add1						
	Add2						
9	Mult1	Yes	DIVD	M(A1)	R(F6)		
	Mult2	Yes	DIVD	M(A2)			Mult1
	Mult3						
	Mult4						

LD/SD Buffers

Time (until complete)	Name	Busy	Addr	Fu
2	Ld1	Yes	0+R1	
	Ld2			
	Sd1	Yes	16(R1)	Mult2
	Sd2			

Cycle 11

Instruction Status Iter 1

Instructions		Issue	Exec Comp	Write Result
LD	F0, 0(R1)	1	2-3	4
DIVD	F2, F0, F6	2	5-	
LD	F6, 8(R1)	3	4-5	6
DIVD	F6, F6, F2	4		
SD	F6, 16(R1)	5		
DADDI	R1, R1, #-32	6	7	8
BNEQZ	R1, LOOP	7	9	10

Instruction Status Iter 2

Issue	Exec Comp	Write Result
10	11-	
11		

Register Result Status

Reg	F0	F2	F6	R1
Funct Unit:	Ld1	Mult3	Mult2	

CDB	FU

Reservation Stations

Time (until complete)	Name	Busy	Op	S1 Vj	S2 Vk	RS Qj	RS Qk
	Add1						
	Add2						
8	Mult1	Yes	DIVD	M(A1)	R(F6)		
	Mult2	Yes	DIVD	M(A2)			Mult1
	Mult3	Yes	DIVD			Ld1	Mult2
	Mult4						

LD/SD Buffers

Time (until complete)	Name	Busy	Addr	Fu
1	Ld1	Yes	0+R1	
	Ld2			
	Sd1	Yes	16(R1)	Mult2
	Sd2			

Cycle 12

Instruction Status Iter 1

Instructions		Issue	Exec Comp	Write Result
LD	F0, 0(R1)	1	2-3	4
DIVD	F2, F0, F6	2	5-	
LD	F6, 8(R1)	3	4-5	6
DIVD	F6, F6, F2	4		
SD	F6, 16(R1)	5		
DADDI	R1, R1, #-32	6	7	8
BNEQZ	R1, LOOP	7	9	10

Instruction Status Iter 2

Issue	Exec Comp	Write Result
10	11-12	
11		
12		

Register Result Status

Reg	F0	F2	F6	R1
Funct Unit:	Ld1	Mult3	Mult2	

CDB	FU

Reservation Stations

Time (until complete)	Name	Busy	Op	S1 Vj	S2 Vk	RS Qj	RS Qk
	Add1						
	Add2						
7	Mult1	Yes	DIVD	M(A1)	R(F6)		
	Mult2	Yes	DIVD	M(A2)			Mult1
	Mult3	Yes	DIVD			Ld1	Mult2
	Mult4						

LD/SD Buffers

Time (until complete)	Name	Busy	Addr	Fu
0	Ld1	Yes	0+R1	
2	Ld2	Yes	8+R1	
	Sd1	Yes	16(R1)	Mult2
	Sd2			

Cycle 13

Instruction Status Iter 1

Instructions		Issue	Exec Comp	Write Result
LD	F0, 0(R1)	1	2-3	4
DIVD	F2, F0, F6	2	5-	
LD	F6, 8(R1)	3	4-5	6
DIVD	F6, F6, F2	4		
SD	F6, 16(R1)	5		
DADDI	R1, R1, #-32	6	7	8
BNEQZ	R1, LOOP	7	9	10

Instruction Status Iter 2

Issue	Exec Comp	Write Result
10	11-12	13
11		
12	13-	
13		

Register Result Status

Reg	F0	F2	F6	R1
Funct Unit:	M(A3)	Mult3	Mult4	

CDB	FU
	Ld1

Reservation Stations

Time (until complete)	Name	Busy	Op	S1 Vj	S2 Vk	RS Qj	RS Qk
	Add1						
	Add2						
6	Mult1	Yes	DIVD	M(A1)	R(F6)		
	Mult2	Yes	DIVD	M(A2)			Mult1
	Mult3	Yes	DIVD	M(A3)			Mult2
	Mult4	Yes	DIVD			Ld2	Mult3

LD/SD Buffers

Time (until complete)	Name	Busy	Addr	Fu
	Ld1			
1	Ld2	Yes	8+R1	
	Sd1	Yes	16(R1)	Mult2
	Sd2			

Cycle 14

Instruction Status Iter 1

Instructions		Issue	Exec Comp	Write Result
LD	F0, 0(R1)	1	2-3	4
DIVD	F2, F0, F6	2	5-	
LD	F6, 8(R1)	3	4-5	6
DIVD	F6, F6, F2	4		
SD	F6, 16(R1)	5		
DADDI	R1, R1, #-32	6	7	8
BNEQZ	R1, LOOP	7	9	10

Instruction Status Iter 2

Issue	Exec Comp	Write Result
10	11-12	13
11		
12	13-14	
13		
14		

Register Result Status

Reg	F0	F2	F6	R1
Funct Unit:	M(A3)	Mult3	Mult4	

CDB	FU

Reservation Stations

Time (until complete)	Name	Busy	Op	S1 Vj	S2 Vk	RS Qj	RS Qk
	Add1						
	Add2						
5	Mult1	Yes	DIVD	M(A1)	R(F6)		
	Mult2	Yes	DIVD	M(A2)			Mult1
	Mult3	Yes	DIVD	M(A3)			Mult2
	Mult4	Yes	DIVD			Ld2	Mult3

LD/SD Buffers

Time (until complete)	Name	Busy	Addr	Fu
	Ld1			
0	Ld2	Yes	8+R1	
	Sd1	Yes	16(R1)	Mult2
	Sd2	Yes	16(R1)	Mult4

Cycle 15

Instruction Status Iter 1

Instructions		Issue	Exec Comp	Write Result
LD	F0, 0(R1)	1	2-3	4
DIVD	F2, F0, F6	2	5-	
LD	F6, 8(R1)	3	4-5	6
DIVD	F6, F6, F2	4		
SD	F6, 16(R1)	5		
DADDI	R1, R1, #-32	6	7	8
BNEQZ	R1, LOOP	7	9	10

Instruction Status Iter 2

Issue	Exec Comp	Write Result
10	11-12	13
11		
12	13-14	15
13		
14		
15		

Register Result Status

Reg	F0	F2	F6	R1
Funct Unit:	M(A3)	Mult3	Mult4	Add1

CDB	FU
	Ld2

Reservation Stations

Time (until complete)	Name	Busy	Op	S1 Vj	S2 Vk	RS Qj	RS Qk
1	Add1	Yes	DADDI	R1	-32		
	Add2						
4	Mult1	Yes	DIVD	M(A1)	R(F6)		
	Mult2	Yes	DIVD	M(A2)			Mult1
	Mult3	Yes	DIVD	M(A3)			Mult2
	Mult4	Yes	DIVD	M(A4)			Mult3

LD/SD Buffers

Time (until complete)	Name	Busy	Addr	Fu
	Ld1			
	Ld2			
	Sd1	Yes	16(R1)	Mult2
	Sd2	Yes	16(R1)	Mult4

Cycle 16

Instruction Status Iter 1

Instructions		Issue	Exec Comp	Write Result
LD	F0, 0(R1)	1	2-3	4
DIVD	F2, F0, F6	2	5-	
LD	F6, 8(R1)	3	4-5	6
DIVD	F6, F6, F2	4		
SD	F6, 16(R1)	5		
DADDI	R1, R1, #-32	6	7	8
BNEQZ	R1, LOOP	7	9	10

Instruction Status Iter 2

Issue	Exec Comp	Write Result
10	11-12	13
11		
12	13-14	15
13		
14		
15	16	
16		

Register Result Status

Reg	F0	F2	F6	R1
Funct Unit:	M(A3)	Mult3	Mult4	Add1

CDB	FU

Reservation Stations

Time (until complete)	Name	Busy	Op	S1 Vj	S2 Vk	RS Qj	RS Qk
0	Add1	Yes	DADDI	R1	-32		
	Add2	Yes	BNEQZ		0	Add1	
3	Mult1	Yes	DIVD	M(A1)	R(F6)		
	Mult2	Yes	DIVD	M(A2)			Mult1
	Mult3	Yes	DIVD	M(A3)			Mult2
	Mult4	Yes	DIVD	M(A4)			Mult3

LD/SD Buffers

Time (until complete)	Name	Busy	Addr	Fu
	Ld1			
	Ld2			
	Sd1	Yes	16(R1)	Mult2
	Sd2	Yes	16(R1)	Mult4

Cycle 17

Instruction Status Iter 1

Instructions		Issue	Exec Comp	Write Result
LD	F0, 0(R1)	1	2-3	4
DIVD	F2, F0, F6	2	5-	
LD	F6, 8(R1)	3	4-5	6
DIVD	F6, F6, F2	4		
SD	F6, 16(R1)	5		
DADDI	R1, R1, #-32	6	7	8
BNEQZ	R1, LOOP	7	9	10

Instruction Status Iter 2

Issue	Exec Comp	Write Result
10	11-12	13
11		
12	13-14	15
13		
14		
15	16	17
16		

Register Result Status

Reg	F0	F2	F6	R1
Funct Unit:	M(A3)	Mult3	Mult4	

CDB	FU
	Add1

Reservation Stations

Time (until complete)	Name	Busy	Op	S1 Vj	S2 Vk	RS Qj	RS Qk
	Add1						
1	Add2	Yes	BNEQZ	R1	0		
2	Mult1	Yes	DIVD	M(A1)	R(F6)		
	Mult2	Yes	DIVD	M(A2)			Mult1
	Mult3	Yes	DIVD	M(A3)			Mult2
	Mult4	Yes	DIVD	M(A4)			Mult3

LD/SD Buffers

Time (until complete)	Name	Busy	Addr	Fu
	Ld1			
	Ld2			
	Sd1	Yes	16(R1)	Mult2
	Sd2	Yes	16(R1)	Mult4

Cycle 18

Instruction Status Iter 1

Instructions		Issue	Exec Comp	Write Result
LD	F0, 0(R1)	1	2-3	4
DIVD	F2, F0, F6	2	5-	
LD	F6, 8(R1)	3	4-5	6
DIVD	F6, F6, F2	4		
SD	F6, 16(R1)	5		
DADDI	R1, R1, #-32	6	7	8
BNEQZ	R1, LOOP	7	9	10

Instruction Status Iter 2

Issue	Exec Comp	Write Result
10	11-12	13
11		
12	13-14	15
13		
14		
15	16	17
16	18	

Register Result Status

Reg	F0	F2	F6	R1
Funct Unit:	M(A3)	Mult3	Mult4	

CDB	FU

Reservation Stations

Time (until complete)	Name	Busy	Op	S1 Vj	S2 Vk	RS Qj	RS Qk
	Add1						
0	Add2	Yes	BNEQZ	R1	0		
1	Mult1	Yes	DIVD	M(A1)	R(F6)		
	Mult2	Yes	DIVD	M(A2)			Mult1
	Mult3	Yes	DIVD	M(A3)			Mult2
	Mult4	Yes	DIVD	M(A4)			Mult3

LD/SD Buffers

Time (until complete)	Name	Busy	Addr	Fu
	Ld1			
	Ld2			
	Sd1	Yes	16(R1)	Mult2
	Sd2	Yes	16(R1)	Mult4

Cycle 19

Instruction Status Iter 1

Instructions		Issue	Exec Comp	Write Result
LD	F0, 0(R1)	1	2-3	4
DIVD	F2, F0, F6	2	5-19	
LD	F6, 8(R1)	3	4-5	6
DIVD	F6, F6, F2	4		
SD	F6, 16(R1)	5		
DADDI	R1, R1, #-32	6	7	8
BNEQZ	R1, LOOP	7	9	10

Instruction Status Iter 2

Issue	Exec Comp	Write Result
10	11-12	13
11		
12	13-14	15
13		
14		
15	16	17
16	18	19

Register Result Status

Reg	F0	F2	F6	R1
Funct Unit:	M(A3)	Mult3	Mult4	

CDB	FU

Reservation Stations

Time (until complete)	Name	Busy	Op	S1 Vj	S2 Vk	RS Qj	RS Qk
	Add1						
	Add2						
0	Mult1	Yes	DIVD	M(A1)	R(F6)		
	Mult2	Yes	DIVD	M(A2)			Mult1
	Mult3	Yes	DIVD	M(A3)			Mult2
	Mult4	Yes	DIVD	M(A4)			Mult3

LD/SD Buffers

Time (until complete)	Name	Busy	Addr	Fu
	Ld1			
	Ld2			
	Sd1	Yes	16(R1)	Mult2
	Sd2	Yes	16(R1)	Mult4

Cycle 20

Instruction Status Iter 1

Instructions		Issue	Exec Comp	Write Result
LD	F0, 0(R1)	1	2-3	4
DIVD	F2, F0, F6	2	5-19	20
LD	F6, 8(R1)	3	4-5	6
DIVD	F6, F6, F2	4		
SD	F6, 16(R1)	5		
DADDI	R1, R1, #-32	6	7	8
BNEQZ	R1, LOOP	7	9	10

Instruction Status Iter 2

Issue	Exec Comp	Write Result
10	11-12	13
11		
12	13-14	15
13		
14		
15	16	17
16	18	19

Register Result Status

Reg	F0	F2	F6	R1
Funct Unit:	M(A3)	Mult3	Mult4	

CDB	FU
	Mult1

Reservation Stations

Time (until complete)	Name	Busy	Op	S1 Vj	S2 Vk	RS Qj	RS Qk
	Add1						
	Add2						
	Mult1						
15	Mult2	Yes	DIVD	M(A2)	M(A5)		
	Mult3	Yes	DIVD	M(A3)			Mult2
	Mult4	Yes	DIVD	M(A4)			Mult3

LD/SD Buffers

Time (until complete)	Name	Busy	Addr	Fu
	Ld1			
	Ld2			
	Sd1	Yes	16(R1)	Mult2
	Sd2	Yes	16(R1)	Mult4

Cycle 21

Instruction Status Iter 1

Instructions		Issue	Exec Comp	Write Result
LD	F0, 0(R1)	1	2-3	4
DIVD	F2, F0, F6	2	5-19	20
LD	F6, 8(R1)	3	4-5	6
DIVD	F6, F6, F2	4	21-	
SD	F6, 16(R1)	5		
DADDI	R1, R1, #-32	6	7	8
BNEQZ	R1, LOOP	7	9	10

Instruction Status Iter 2

Issue	Exec Comp	Write Result
10	11-12	13
11		
12	13-14	15
13		
14		
15	16	17
16	18	19

Register Result Status

Reg	F0	F2	F6	R1
Funct Unit:	M(A3)	Mult3	Mult4	

CDB	FU

Reservation Stations

Time (until complete)	Name	Busy	Op	S1 Vj	S2 Vk	RS Qj	RS Qk
	Add1						
	Add2						
	Mult1						
14	Mult2	Yes	DIVD	M(A2)	M(A5)		
	Mult3	Yes	DIVD	M(A3)			Mult2
	Mult4	Yes	DIVD	M(A4)			Mult3

LD/SD Buffers

Time (until complete)	Name	Busy	Addr	Fu
	Ld1			
	Ld2			
	Sd1	Yes	16(R1)	Mult2
	Sd2	Yes	16(R1)	Mult4

Cycle 35

Instruction Status Iter 1

Instructions		Issue	Exec Comp	Write Result
LD	F0, 0(R1)	1	2-3	4
DIVD	F2, F0, F6	2	5-19	20
LD	F6, 8(R1)	3	4-5	6
DIVD	F6, F6, F2	4	21-35	
SD	F6, 16(R1)	5		
DADDI	R1, R1, #-32	6	7	8
BNEQZ	R1, LOOP	7	9	10

Instruction Status Iter 2

Issue	Exec Comp	Write Result
10	11-12	13
11		
12	13-14	15
13		
14		
15	16	17
16	18	19

Register Result Status

Reg	F0	F2	F6	R1
Funct Unit:	M(A3)	Mult3	Mult4	

CDB	FU

Reservation Stations

Time (until complete)	Name	Busy	Op	S1 Vj	S2 Vk	RS Qj	RS Qk
	Add1						
	Add2						
	Mult1						
0	Mult2	Yes	DIVD	M(A2)	M(A5)		
	Mult3	Yes	DIVD	M(A3)			Mult2
	Mult4	Yes	DIVD	M(A4)			Mult3

LD/SD Buffers

Time (until complete)	Name	Busy	Addr	Fu
	Ld1			
	Ld2			
	Sd1	Yes	16(R1)	Mult2
	Sd2	Yes	16(R1)	Mult4

Cycle 36

Instruction Status Iter 1

Instructions		Issue	Exec Comp	Write Result
LD	F0, 0(R1)	1	2-3	4
DIVD	F2, F0, F6	2	5-19	20
LD	F6, 8(R1)	3	4-5	6
DIVD	F6, F6, F2	4	21-35	36
SD	F6, 16(R1)	5		
DADDI	R1, R1, #-32	6	7	8
BNEQZ	R1, LOOP	7	9	10

Instruction Status Iter 2

Issue	Exec Comp	Write Result
10	11-12	13
11		
12	13-14	15
13		
14		
15	16	17
16	18	19

Register Result Status

Reg	F0	F2	F6	R1
Funct Unit:	M(A3)	Mult3	Mult4	

CDB	FU
	Mult2

Reservation Stations

Time (until complete)	Name	Busy	Op	S1 Vj	S2 Vk	RS Qj	RS Qk
	Add1						
	Add2						
	Mult1						
	Mult2						
15	Mult3	Yes	DIVD	M(A3)	M(A6)		
	Mult4	Yes	DIVD	M(A4)			Mult3

LD/SD Buffers

Time (until complete)	Name	Busy	Addr	Fu
	Ld1			
	Ld2			
2	Sd1	Yes	16(R1)	
	Sd2	Yes	16(R1)	Mult4

Cycle 37

Instruction Status Iter 1

Instructions		Issue	Exec Comp	Write Result
LD	F0, 0(R1)	1	2-3	4
DIVD	F2, F0, F6	2	5-19	20
LD	F6, 8(R1)	3	4-5	6
DIVD	F6, F6, F2	4	21-35	36
SD	F6, 16(R1)	5	37-	
DADDI	R1, R1, #-32	6	7	8
BNEQZ	R1, LOOP	7	9	10

Instruction Status Iter 2

Issue	Exec Comp	Write Result
10	11-12	13
11	37-	
12	13-14	15
13		
14		
15	16	17
16	18	19

Register Result Status

Reg	F0	F2	F6	R1
Funct Unit:	M(A3)	Mult3	Mult4	

CDB	FU

Reservation Stations

Time (until complete)	Name	Busy	Op	S1 Vj	S2 Vk	RS Qj	RS Qk
	Add1						
	Add2						
	Mult1						
	Mult2						
14	Mult3	Yes	DIVD	M(A3)	M(A6)		
	Mult4	Yes	DIVD	M(A4)			Mult3

LD/SD Buffers

Time (until complete)	Name	Busy	Addr	Fu
	Ld1			
	Ld2			
1	Sd1	Yes	16(R1)	
	Sd2	Yes	16(R1)	Mult4

Cycle 38

Instruction Status Iter 1

Instructions		Issue	Exec Comp	Write Result
LD	F0, 0(R1)	1	2-3	4
DIVD	F2, F0, F6	2	5-19	20
LD	F6, 8(R1)	3	4-5	6
DIVD	F6, F6, F2	4	21-35	36
SD	F6, 16(R1)	5	37-38	
DADDI	R1, R1, #-32	6	7	8
BNEQZ	R1, LOOP	7	9	10

Instruction Status Iter 2

Issue	Exec Comp	Write Result
10	11-12	13
11	37-	
12	13-14	15
13		
14		
15	16	17
16	18	19

Register Result Status

Reg	F0	F2	F6	R1
Funct Unit:	M(A3)	Mult3	Mult4	

CDB	FU

Reservation Stations

Time (until complete)	Name	Busy	Op	S1 Vj	S2 Vk	RS Qj	RS Qk
	Add1						
	Add2						
	Mult1						
	Mult2						
13	Mult3	Yes	DIVD	M(A3)	M(A6)		
	Mult4	Yes	DIVD	M(A4)			Mult3

LD/SD Buffers

Time (until complete)	Name	Busy	Addr	Fu
	Ld1			
	Ld2			
0	Sd1	Yes	16(R1)	
	Sd2	Yes	16(R1)	Mult4

Cycle 39

Instruction Status Iter 1

Instructions		Issue	Exec Comp	Write Result
LD	F0, 0(R1)	1	2-3	4
DIVD	F2, F0, F6	2	5-19	20
LD	F6, 8(R1)	3	4-5	6
DIVD	F6, F6, F2	4	21-35	36
SD	F6, 16(R1)	5	37-38	39
DADDI	R1, R1, #-32	6	7	8
BNEQZ	R1, LOOP	7	9	10

Instruction Status Iter 2

Issue	Exec Comp	Write Result
10	11-12	13
11	37-	
12	13-14	15
13		
14		
15	16	17
16	18	19

Register Result Status

Reg	F0	F2	F6	R1
Funct Unit:	M(A3)	Mult3	Mult4	

CDB	FU

Reservation Stations

Time (until complete)	Name	Busy	Op	S1 Vj	S2 Vk	RS Qj	RS Qk
	Add1						
	Add2						
	Mult1						
	Mult2						
12	Mult3	Yes	DIVD	M(A3)	M(A6)		
	Mult4	Yes	DIVD	M(A4)			Mult3

LD/SD Buffers

Time (until complete)	Name	Busy	Addr	Fu
	Ld1			
	Ld2			
	Sd1			
	Sd2	Yes	16(R1)	Mult4

Cycle 51

Instruction Status Iter 1

Instructions		Issue	Exec Comp	Write Result
LD	F0, 0(R1)	1	2-3	4
DIVD	F2, F0, F6	2	5-19	20
LD	F6, 8(R1)	3	4-5	6
DIVD	F6, F6, F2	4	21-35	36
SD	F6, 16(R1)	5	37-38	39
DADDI	R1, R1, #-32	6	7	8
BNEQZ	R1, LOOP	7	9	10

Instruction Status Iter 2

Issue	Exec Comp	Write Result
10	11-12	13
11	37-51	
12	13-14	15
13		
14		
15	16	17
16	18	19

Register Result Status

Reg	F0	F2	F6	R1
Funct Unit:	M(A3)	Mult3	Mult4	

CDB	FU

Reservation Stations

Time (until complete)	Name	Busy	Op	S1 Vj	S2 Vk	RS Qj	RS Qk
	Add1						
	Add2						
	Mult1						
	Mult2						
0	Mult3	Yes	DIVD	M(A3)	M(A6)		
	Mult4	Yes	DIVD	M(A4)			Mult3

LD/SD Buffers

Time (until complete)	Name	Busy	Addr	Fu
	Ld1			
	Ld2			
	Sd1			
	Sd2	Yes	16(R1)	Mult4

Cycle 52

Instruction Status Iter 1

Instructions		Issue	Exec Comp	Write Result
LD	F0, 0(R1)	1	2-3	4
DIVD	F2, F0, F6	2	5-19	20
LD	F6, 8(R1)	3	4-5	6
DIVD	F6, F6, F2	4	21-35	36
SD	F6, 16(R1)	5	37-38	39
DADDI	R1, R1, #-32	6	7	8
BNEQZ	R1, LOOP	7	9	10

Instruction Status Iter 2

Issue	Exec Comp	Write Result
10	11-12	13
11	37-51	52
12	13-14	15
13		
14		
15	16	17
16	18	19

Register Result Status

Reg	F0	F2	F6	R1
Funct Unit:	M(A3)	M(A8)	Mult4	

CDB	FU
	Mult3

Reservation Stations

Time (until complete)	Name	Busy	Op	S1 Vj	S2 Vk	RS Qj	RS Qk
	Add1						
	Add2						
	Mult1						
	Mult2						
	Mult3						
15	Mult4	Yes	DIVD	M(A4)	M(A8)		

LD/SD Buffers

Time (until complete)	Name	Busy	Addr	Fu
	Ld1			
	Ld2			
	Sd1			
	Sd2	Yes	16(R1)	Mult4

Cycle 53

Instruction Status Iter 1

Instructions		Issue	Exec Comp	Write Result
LD	F0, 0(R1)	1	2-3	4
DIVD	F2, F0, F6	2	5-19	20
LD	F6, 8(R1)	3	4-5	6
DIVD	F6, F6, F2	4	21-35	36
SD	F6, 16(R1)	5	37-38	39
DADDI	R1, R1, #-32	6	7	8
BNEQZ	R1, LOOP	7	9	10

Instruction Status Iter 2

Issue	Exec Comp	Write Result
10	11-12	13
11	37-51	52
12	13-14	15
13	53-	
14		
15	16	17
16	18	19

Register Result Status

Reg	F0	F2	F6	R1
Funct Unit:	M(A3)	M(A8)	Mult4	

CDB	FU

Reservation Stations

Time (until complete)	Name	Busy	Op	S1 Vj	S2 Vk	RS Qj	RS Qk
	Add1						
	Add2						
	Mult1						
	Mult2						
	Mult3						
14	Mult4	Yes	DIVD	M(A4)	M(A8)		

LD/SD Buffers

Time (until complete)	Name	Busy	Addr	Fu
	Ld1			
	Ld2			
	Sd1			
	Sd2	Yes	16(R1)	Mult4

Cycle 67

Instruction Status Iter 1

Instructions		Issue	Exec Comp	Write Result
LD	F0, 0(R1)	1	2-3	4
DIVD	F2, F0, F6	2	5-19	20
LD	F6, 8(R1)	3	4-5	6
DIVD	F6, F6, F2	4	21-35	36
SD	F6, 16(R1)	5	37-38	39
DADDI	R1, R1, #-32	6	7	8
BNEQZ	R1, LOOP	7	9	10

Instruction Status Iter 2

Issue	Exec Comp	Write Result
10	11-12	13
11	37-51	52
12	13-14	15
13	53-67	
14		
15	16	17
16	18	19

Register Result Status

Reg	F0	F2	F6	R1
Funct Unit:	M(A3)	M(A8)	Mult4	

CDB	FU

Reservation Stations

Time (until complete)	Name	Busy	Op	S1 Vj	S2 Vk	RS Qj	RS Qk
	Add1						
	Add2						
	Mult1						
	Mult2						
	Mult3						
0	Mult4	Yes	DIVD	M(A4)	M(A8)		

LD/SD Buffers

Time (until complete)	Name	Busy	Addr	Fu
	Ld1			
	Ld2			
	Sd1			
	Sd2	Yes	16(R1)	Mult4

Cycle 68

Instruction Status Iter 1

Instructions		Issue	Exec Comp	Write Result
LD	F0, 0(R1)	1	2-3	4
DIVD	F2, F0, F6	2	5-19	20
LD	F6, 8(R1)	3	4-5	6
DIVD	F6, F6, F2	4	21-35	36
SD	F6, 16(R1)	5	37-38	39
DADDI	R1, R1, #-32	6	7	8
BNEQZ	R1, LOOP	7	9	10

Instruction Status Iter 2

Issue	Exec Comp	Write Result
10	11-12	13
11	37-51	52
12	13-14	15
13	53-67	68
14		
15	16	17
16	18	19

Register Result Status

Reg	F0	F2	F6	R1
Funct Unit:	M(A3)	M(A8)	M(A7)	

CDB	FU
	Mult4

Reservation Stations

Time (until complete)	Name	Busy	Op	S1 Vj	S2 Vk	RS Qj	RS Qk
	Add1						
	Add2						
	Mult1						
	Mult2						
	Mult3						
	Mult4						

LD/SD Buffers

Time (until complete)	Name	Busy	Addr	Fu
	Ld1			
	Ld2			
	Sd1			
2	Sd2	Yes	16(R1)	

Cycle 69

Instruction Status Iter 1

Instructions		Issue	Exec Comp	Write Result
LD	F0, 0(R1)	1	2-3	4
DIVD	F2, F0, F6	2	5-19	20
LD	F6, 8(R1)	3	4-5	6
DIVD	F6, F6, F2	4	21-35	36
SD	F6, 16(R1)	5	37-38	39
DADDI	R1, R1, #-32	6	7	8
BNEQZ	R1, LOOP	7	9	10

Instruction Status Iter 2

Issue	Exec Comp	Write Result
10	11-12	13
11	37-51	52
12	13-14	15
13	53-67	68
14	69-	
15	16	17
16	18	19

Register Result Status

Reg	F0	F2	F6	R1
Funct Unit:	M(A3)	M(A8)	M(A7)	

CDB	FU

Reservation Stations

Time (until complete)	Name	Busy	Op	S1 Vj	S2 Vk	RS Qj	RS Qk
	Add1						
	Add2						
	Mult1						
	Mult2						
	Mult3						
	Mult4						

LD/SD Buffers

Time (until complete)	Name	Busy	Addr	Fu
	Ld1			
	Ld2			
	Sd1			
1	Sd2	Yes	16(R1)	

Cycle 70

Instruction Status Iter 1

Instructions		Issue	Exec Comp	Write Result
LD	F0, 0(R1)	1	2-3	4
DIVD	F2, F0, F6	2	5-19	20
LD	F6, 8(R1)	3	4-5	6
DIVD	F6, F6, F2	4	21-35	36
SD	F6, 16(R1)	5	37-38	39
DADDI	R1, R1, #-32	6	7	8
BNEQZ	R1, LOOP	7	9	10

Instruction Status Iter 2

Issue	Exec Comp	Write Result
10	11-12	13
11	37-51	52
12	13-14	15
13	53-67	68
14	69-70	
15	16	17
16	18	19

Register Result Status

Reg	F0	F2	F6	R1
Funct Unit:	M(A3)	M(A8)	M(A7)	

CDB	FU

Reservation Stations

Time (until complete)	Name	Busy	Op	S1 Vj	S2 Vk	RS Qj	RS Qk
	Add1						
	Add2						
	Mult1						
	Mult2						
	Mult3						
	Mult4						

LD/SD Buffers

Time (until complete)	Name	Busy	Addr	Fu
	Ld1			
	Ld2			
	Sd1			
0	Sd2	Yes	16(R1)	

Cycle 71

Instruction Status Iter 1

Instructions		Issue	Exec Comp	Write Result
LD	F0, 0(R1)	1	2-3	4
DIVD	F2, F0, F6	2	5-19	20
LD	F6, 8(R1)	3	4-5	6
DIVD	F6, F6, F2	4	21-35	36
SD	F6, 16(R1)	5	37-38	39
DADDI	R1, R1, #-32	6	7	8
BNEQZ	R1, LOOP	7	9	10

Instruction Status Iter 2

Issue	Exec Comp	Write Result
10	11-12	13
11	37-51	52
12	13-14	15
13	53-67	68
14	69-70	71
15	16	17
16	18	19

Register Result Status

Reg	F0	F2	F6	R1
Funct Unit:	M(A3)	M(A8)	M(A9)	

CDB	FU

Reservation Stations

Time (until complete)	Name	Busy	Op	S1 Vj	S2 Vk	RS Qj	RS Qk
	Add1						
	Add2						
	Mult1						
	Mult2						
	Mult3						
	Mult4						

LD/SD Buffers

Time (until complete)	Name	Busy	Addr	Fu
	Ld1			
	Ld2			
	Sd1			
	Sd2			

Reservation Station Notes

Op: Operation to perform in the unit

Qj, Qk: Reservation stations producing source registers (value to be written)

- Note: No ready flags needed as in Scoreboard
- Qj,Qk=0 => ready
- Store buffers only have Qi for RS producing result

Vj, Vk: Value of Source operands

- Store buffers has V field, result to be stored

Busy: Indicates reservation station or FU are occupied

Register Result Status: Indicates which functional unit will write each register, if one exists. Blank when no pending instructions that will write that register.

Tips: How to Update each Slide

1. Renumber Cycle on Slide
2. To Issue an Instruction
    1. Add cycle number when issued
    2. Update Reservation Station
        1. Check if instruction inputs are ready (Vi, Vk) or not ready (Qi, Qk)
            1. If data is not ready, identify which Function Unit will produce using Register Result Status
    3. For non SD / BR instructions – must update Register Result Status
3. To Update Instructions in Execution
    1. Change time to finish execution
    2. If time = 0, write in cycle on exe in Instruction Status table
4. To Update Instructions in Write Result
    1. For non SD / BR instructions – write FU to CDB
    2. Fill in cycle number for write back
    3. Only 1 instruction may write to CDB at a time (but SD / BR can also be in Write Result stage since not using CDB)
    4. Remove data from reservation station
    5. Update all Reservation Stations which depended on FU for data