ESE 345 Multimedia Unit	
Reynerio Rubio and John Kim	
-output values from each stage of this three stage pipeline	
-Instruction Fetch	
-Instruction Decode	
-Execution/Write Back	
-LXECULION/ WI I LE DACK	
Cycle 0	
INSTRUCTION FETCH STAGE	
instruction: 101111111111111111001111	
INSTRUCTION DECODE STAGE	
instruction: 000000000000000000000000000000000000	
instruction: nop	
rs2(00000) = 000000000000000000000000000000	
rs1(00000) = 000000000000000000000000000000	
rd (00000) = 00000000000000000000000000000	
EXECUTE/WRITE BACK STAGE	
instruction: nop	
rs2 = 00000000000000000000000000000000000	
rs1 = 00000000000000000000000000000000000	
rd = 00000000000000000000000000000000000	
alu_out = 00000000000000000000000000000000000	
write_en = 0	
Cycle 1	
INSTRUCTION FETCH STAGE	
instruction: 000000001000000111101100	
THETPHOTTON DECODE STAGE	
INSTRUCTION DECODE STAGE	
instruction: 1011111111111111111111111111111111111	
instruction: li	
field: 01	
immediate: 1111111111110	
rd: 01111	

results tyt

results.txt
EXECUTE/WRITE BACK STAGE
instruction: nop
rs2 = 00000000000000000000000000000000000
rs1 = 00000000000000000000000000000000000
rd = 00000000000000000000000000000000000
alu_out = 00000000000000000000000000000000000
Cycle 2
INSTRUCTION FETCH STAGE
instruction: 00000100001100011000
INSTRUCTION DECODE STAGE
instruction: 000000001000000111101100
instruction: bcw
rs2(00000) = 000000000000000000000000000000
rs1(01111) = 0000000000000000000000000000000
rd (01100) = 0000000000000000000000000000000
EVECUTE /UDITE DACK STACE
instruction: li
field: 01
immediate: 11111111111110
rd: 01111
alu_out = 00000000000000000000000000000000000
write_en = 1
Cycle 3
INSTRUCTION FETCH STAGE
instruction: 1101111111111111111111111111111111111
INSTRUCTION DECODE STAGE
instruction: 00000100001100011000
instruction: a
rs2(01100) = 1111111111111110000000000000000
rs1(01100) = 1111111111111110000000000000000
rd (01100) = 1111111111111100000000000000011111111
. 4 (01100) 11111111111111100000000000011111111
EXECUTE/WRITE BACK STAGE
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	results.txt	
instruction:	bcw	
rs2	= 0000000000000000000000000000000000000	
rs1	= 0000000000000000000000000000000000011111	
rd	= 0000000000000000000000000000000000000	
alu_out	= 1111111111111111000000000000000000111111	
write_en	= 1	
=========		
Cycle 4		
	INSTRUCTION FETCH STAGE	
instruction:	0000010010110000111100001	
	INSTRUCTION DECODE STAGE	
instruction:	110111111111111111111111111111111111111	
instructi	on: li	
field:	10	
immediate	: 1111111111111	
rd:	01111	
	EXECUTE/WRITE BACK STAGE	
instruction:	·	
rs2	= 1111111111111111100000000000000000001111	
rs1		
rd	= 111111111111111000000000000000011111111	
T G		
alu_out	= 111111111111110000000000000000000111111	
	= 1	
==========	<u>-</u>	
Cycle 5		
	INSTRUCTION FETCH STAGE	
	000000100111100001	
instruction.		
	INSTRUCTION DECODE STAGE	
	0000010010111100001	
instruction: sfw		
rs2(01100) = 1111111111111100000000000000000		
•	) = 000000000000111111111111111111111111	
	) = 00000000000000000000000000000000000	
I'U (00001	) - 00000000000000000000000000000000000	
	EXECUTE/WRITE BACK STAGE	
instructi	·	
THECHACT	on. II	

field: 10 immediate: 1111111111111111 rd· 01111 write en = 1\_\_\_\_\_\_ Cvcle 6 -----INSTRUCTION FETCH STAGE-----instruction: 000000011011000111100001 -----INSTRUCTION DECODE STAGE----instruction: 000000010011000111100001 instruction: and -----EXECUTE/WRITE BACK STAGE-----instruction: sfw rs2 rs1 rd write en = 1\_\_\_\_\_\_ Cvcle 7 -----INSTRUCTION FETCH STAGE-----instruction: 000000100000000111100001 -----INSTRUCTION DECODE STAGE----instruction: 000000011011000111100001 instruction: or -----BXECUTE/WRITE BACK STAGE------instruction: and rs2 

	Tesuits.txt
rs1	= 0000000000000000111111111111111111111
rd	= 0000000000000000000000000000000000000
alu_out	= 00000000000000000000000000000011111111
write_en	
==========	- • :====================================
Cycle 8	
	INSTRUCTION FETCH STAGE
instruction:	000000101000000111100001
	INSTRUCTION DECODE STAGE
instruction:	00000010000000111100001
instruction:	popcnth
rs2(00000	a) = 00000000000000000000000000000000000
rs1(01111	L) = 000000000000000111111111111111111111
rd (00001	1) = 11111111111111100111111111111111111
	EXECUTE/WRITE BACK STAGE
instruction:	or or
	= 111111111111110000000000000000000111111
	= 0000000000000001111111111111111111111
rd	= 00000000000000000000000000001111111111
alu_out	= 1111111111111001111111111111111111111
write_en	
Cycle 9	
	INSTRUCTION FETCH STAGE
instruction:	1000000000000000101101
	INSTRUCTION DECODE STAGE
instruction:	00000101000000111100001
instruction	
	0) = 0000000000000000000000000000000000
•	L) = 000000000000000111111111111111111111
•	L) = 00000000000000000000000000000000000
	EXECUTE/WRITE BACK STAGE
instruction	
	= 000000000000000000000000000000000000
_	= 000000000000000000000000000000000000
rs1	= 0000000000000000000000000000000000000

write en = 1\_\_\_\_\_\_ Cycle 10 -----INSTRUCTION FETCH STAGE----instruction: 000000110011010111100001 ------STRUCTION DECODE STAGE----instruction: 1000000000000000000101101 instruction: li field: 99 immediate: 0000000000000001 rd: 01101 -----BXECUTE/WRITE BACK STAGE-----------instruction: clz rs1 write en = 1\_\_\_\_\_\_ Cvcle 11 -----INSTRUCTION FETCH STAGE----instruction: 000000111011010111100001 -----INSTRUCTION DECODE STAGE----instruction: 000000110011010111100001 instruction: rot -----EXECUTE/WRITE BACK STAGE-----instruction: li field: immediate: 0000000000000001 rd: 01101

alu_out write_en	= 000000000000000000000000000000000000
Cycle 12	
	INSTRUCTION FETCH STAGE
instruction:	000001010011110000101100
	INSTRUCTION DECODE STAGE
	000000111011010111100001
instruction:	
•	) = 00000000000000000000000000000000000
•	) = 000000000000011111111111111111111111
ra (00001	) = 000000000000000111111111111111111111
	EXECUTE/WRITE BACK STAGE
instruction:	
rs2	= 0000000000000000000000000000000000000
rs1	<pre>= 000000000000000000000000000000000000</pre>
rd	= 0000000000000000000000000000000000000
alu_out	= 0000000000000011111111111111111111111
write_en	= 1
Cycle 13	INSTRUCTION FETCH STAGE
	00000101101110110001101
instruction.	
	INSTRUCTION DECODE STAGE
	000001010011110000101100
instruction:	
•	) = 000000000000001111111111111111111111
	) = 000000000000011111111111111111111111
rd (01100	) = 111111111111110000000000000000000111111
	EXECUTE/WRITE BACK STAGE
instruction:	
	= 0000000000000000000000000000000000000
rs1	= 0000000000000011111111111111111111111
rd	= 0000000000000001111111111111111111111

	resurcs.txt
alu_out	= 0000000000000011111111111111111111111
write_en	= 1
Cycle 14	
	INSTRUCTION FETCH STAGE
instruction:	100100000000000000000000000000000000000
	INSTRUCTION DECODE STAGE
	00000101101110110001101
instruction:	
	) = 000000000000001111111111111111111111
	) = 000000000000001111111111111111111111
,	) = 00000000000000000000000000000000000
14 (01101	<i>y</i> = 00000000000000000000000000000000000
	EXECUTE/WRITE BACK STAGE
instruction:	ah
rs2	= 0000000000000011111111111111111111111
rs1	= 0000000000000011111111111111111111111
rd	= 111111111111110000000000000000000111111
alu_out	= 0000000000000001111111111111111111111
write_en	
Cycle 15	INSTRUCTION FETCH STAGE
	10101111111111111000001
Tilsti uccion.	101011111111111111111111111111111111111
	INSTRUCTION DECODE STAGE
	100100000000000000000000000000000000000
instruction	on: li
field:	00
immediate	: 100000000000000
rd:	00001
	EXECUTE/WRITE BACK STAGE
instruction:	
	= 0000000000000111111111111111111111111
rs1	= 0000000000001111111111111111111111111
rd	= 0000000000000000000000000000000000000
alu ou+	= 0000000000000000000000000000000000000
alu_out	- 2000000000000000000000000000000000000

	results.txt
write_en = 1	
Cycle 16	
	STRUCTION FETCH STAGE
instruction: 1010000	
	·····
IN	STRUCTION DECODE STAGE
instruction: 101011111	111111111000001
instruction: li	
field: 01	
immediate: 01111	1111111110
rd: 00001	
FV	VECUTE (UDITE DACK CTACE
instruction: li	ECUTE/WRITE BACK STAGE
	000000000
immediate: 1000 rd: 0000	
rd: 0000	1
alu out = 00000	000000000011111111111111111111111111111
write_en = 1	
<del>-</del>	
Cycle 17	
IN	STRUCTION FETCH STAGE
instruction: 0000011	00011010110001101
	STRUCTION DECODE STAGE
instruction: 101000000	000000111101101
instruction: li	
field: 01	••••
immediate: 00000	
rd: 01101	
FX	ECUTE/WRITE BACK STAGE
instruction: li	
field: 01	
immediate: 0111	11111111110
immediate: 0111 rd: 0000	
alu_out = 00000	000000000011111111111111111111111111111
write_en = 1	
_	Page 9

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Cycle 18	
INSTRUCTION FETCH STAGE	
instruction: 000001101011000111101101	
INSTRUCTION DECODE STAGE	
instruction: 0000011000110101010101	
instruction: ahs	
rs2(01101) = 0000000000000000000000000000000	
rs1(01100) = 0000000000000000111111111111111	
rd (01101) = 0000000000000000000000000000000	
()	
EXECUTE/WRITE BACK STAGE	
instruction: li	
field: 01	
immediate: 00000000001111	
rd: 01101	
_	
alu_out = 00000000000000000000000000000000000	
write_en = 1	
Cycle 19	:====
INSTRUCTION FETCH STAGE	
instruction: 1001010101010101000010	
INSTRUCTION DECODE STAGE	
instruction: 000001101011000111101101	
instruction: sfhs	
rs2(01100) = 0000000000000000011111111111111	
rs1(01111) = 0000000000000000011111111111111	
rd (01101) = 0000000000000000111111111111111	
EXECUTE/WRITE BACK STAGE	
instruction: ahs	
rs2 = 00000000000000000000000000000000000	
rs1 = 00000000000000111111111111111111111	
rd = 00000000000000000000000000000000000	
alu_out = 000000000000000111111111111111101000000	
write_en = 1	
	:====

	results.txt
Cycle 20	
	INSTRUCTION FETCH STAGE
instruction: 11001	01010101010100010
	INSTRUCTION DECODE STAGE
instruction: 1001010	101010101000010
instruction: li	
field: 00	
immediate: 101	
rd: 000	10
	EXECUTE/WRITE BACK STAGE
instruction: sfhs	
	000000000000111111111111111111111111111
rs1 = 000	000000000000111111111111111111111111111
rd = 000	000000000000111111111111111101000000000
alu out = 000	000000000000000000000000000000000000000
write_en = 1	
	INSTRUCTION FETCH STAGE
instruction: 00000	11100001000010
	INSTRUCTION DECODE STAGE
instruction: 1100101	
instruction: li	
field: 10	
immediate: 010	10101010101
rd: 000	
	EXECUTE/WRITE BACK STAGE
instruction: li	
field: 00	
immediate: 10	101010101010
rd: 00	
alu_out = 000	000000000000000000000000000000000000000
write_en = 1	
Cycle 22	

results.txt ------ STAGE-----INSTRUCTION FETCH STAGE----instruction: 000001111000010111101101 ------STRUCTION DECODE STAGE----instruction: 000001110000100001000010 instruction: mpvu -----EXECUTE/WRITE BACK STAGE------instruction: li field: 10 immediate: 0101010101010101 rd: 00010 write en = 1\_\_\_\_\_\_\_ Cycle 23 -----INSTRUCTION FETCH STAGE----instruction: 000001111011110000101101 -----INSTRUCTION DECODE STAGE----instruction: 000001111000010111101101 instruction: absdb -----BACK STAGE------EXECUTE/WRITE BACK STAGE----instruction: mpyu rs2 rs1 rd alu out = 0001110001110001100011100011100101110001110001110001110001100100 write en = 1\_\_\_\_\_\_ Cvcle 24

-----INSTRUCTION FETCH STAGE-----

results.txt
instruction: 10100100000000000001110
INSTRUCTION DECODE STAGE
instruction: 000001111011110000101101
instruction: absdb
rs2(01111) = 0000000000000001111111111111111
rs1(00001) = 0000000000000011111111111111111
rd (01101) = 000000000000000000000000000000110000000
EXECUTE/WRITE BACK STAGE
instruction: absdb
rs2 = 000000000000000111111111111111111111
rs2 = 000000000000001111111111111111111111
LQ = 00000000000000000000000000000000000
alu_out = 00000000000000000000000000000000000
write_en = 1
Cycle 25
INSTRUCTION FETCH STAGE
instruction: 010101110011100011000010
INSTRUCTION DECODE STAGE
instruction: 101001000000000000001110
instruction: li
field: 01
immediate: 00100000000000
rd: 01110
EXECUTE/WRITE BACK STAGE
instruction: absdb
rs2 = 000000000000000111111111111111111111
rs1 = 00000000000000111111111111111111111
rd = 00000000000000000000000000000000000
alu_out = 00000000000000000000000000000000000
write_en = 1
INSTRUCTION FETCH STAGE
instruction: 010101110011100011000010

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instruction: 010101110011100111000010
instruction: MA high
 rd (00010) = 00011100011100011000111000111001011100011100011100011100011100100
------ BACK STAGE------EXECUTE/WRITE BACK STAGE--------------
 instruction: li
 field:
 immediate: 0010000000000000
 rd:
      01110
 write en = 1
______
Cycle 27
-----INSTRUCTION FETCH STAGE-----
instruction: 011101110011100011000010
------STRUCTION DECODE STAGE------
instruction: 010101110011100011000010
instruction: MA high
 ----- BACK STAGE------EXECUTE/WRITE BACK STAGE-----
instruction: MA high
 rs3
    rs2
    rs1
     rd
     = 00011100011100011000111000111001011100011100011100011100011100100
 alu out
     write en = 1
```

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Cycle 28
-----INSTRUCTION FETCH STAGE-----
instruction: 110000000000000010100110
-----INSTRUCTION DECODE STAGE-----
instruction: 011101110011100011000010
instruction: MS high
 -----EXECUTE/WRITE BACK STAGE---------
instruction: MA high
 rs3
    rs1
    rd
     alu out
    write en = 1
         ______
Cycle 29
-----INSTRUCTION FETCH STAGE------
instruction: 100000000000000011000110
-----INSTRUCTION DECODE STAGE-----
instruction: 110000000000000010100110
 instruction: li
 field:
 immediate: 0000000000000101
 rd:
     00110
------ BACK STAGE------EXECUTE/WRITE BACK STAGE--------------
instruction: MS high
 rs3
    rs2
    rs1
    rd
```

alu_out	
Cycle 30	
	INSTRUCTION FETCH STAGE L0000110001100011000010
	INSTRUCTION DECODE STAGE
instruction: 1000	0000000000011000110
	00
	00000000000110
rd:	
	EXECUTE/WRITE BACK STAGE
instruction:	
field:	10
<pre>immediate:</pre>	00000000000101
rd:	00110
write_en =	
Cycle 31	
	INSTRUCTION FETCH STAGE
instruction: 01	11000110001100011000010
	INSTRUCTION DECODE STAGE
instruction: MA	
rs3(00110) =	000000000000000000000000000000000000000
rs2(00110) =	000000000000000000000000000000000000000
rs1(00110) =	000000000000000000000000000000000000000
rd (00010) =	000000000000000000000000000000000000000
	EXECUTE/WRITE BACK STAGE
instruction:	li
field:	00
	0000000000110
rd:	00110

alu_out	
Cycle 32	
	INSTRUCTION FETCH STAGE L0111111111111111001111
	INSTRUCTION DECODE STAGE
instruction: 011	1000110001100011000010
	- 000000000000000000000000000001010000000
•	= 0000000000000000000000000000000000000
•	- 0000000000000000000000000000000000000
rd (00010) =	= 000000000000000000000000001000110000000
	EXECUTE/WRITE BACK STAGE
instruction: MA	·
	- 0000000000000000000000000000000000000
	= 0000000000000000000000000000000000000
_	- 000000000000000000000000000001010000000
ru -	- 0000000000000000000000000000000000000
alu out =	= 000000000000000000000000010001100000000
<b>-</b>	= 1
Cycle 33	
	INSTRUCTION FETCH STAGE
instruction: 0	00000001000000111101100
	INSTRUCTION DECODE STAGE
	111111111111111001111
instruction:	: li
field:	01
	11111111111111
rd:	ATTI
	EXECUTE/WRITE BACK STAGE
instruction: MS	· <del>- ·</del> ·
rs3 =	- 000000000000000000000000000010100000000

rs2	= 000000000000000000000000000001010000000
rs1	= 000000000000000000000000000000101000000
rd	= 000000000000000000000000010001100000000
alu_out	= 1111111111111111111111111111111111111
write_en	= 1
Cycle 34	
	INSTRUCTION FETCH STAGE
instruction:	0000010000110001100
	THISTOLIGITANI DECODE STACE
INSTRUCTION DECODE STAGE	
	00000001000000111101100
instruction	
•	b) = 00000000000000000000000000000000000
•	1) = 00000000000000001111111111111111111
rd (0110	9) = 000000000000000111111111111111111111
	EXECUTE/WRITE BACK STAGE
instruction: li	
field:	01
immediat	2: 1111111111111
rd:	01111
- <b></b>	
alu_out	= 0000000000000001111111111111111111111
write_en	= 1
=========	