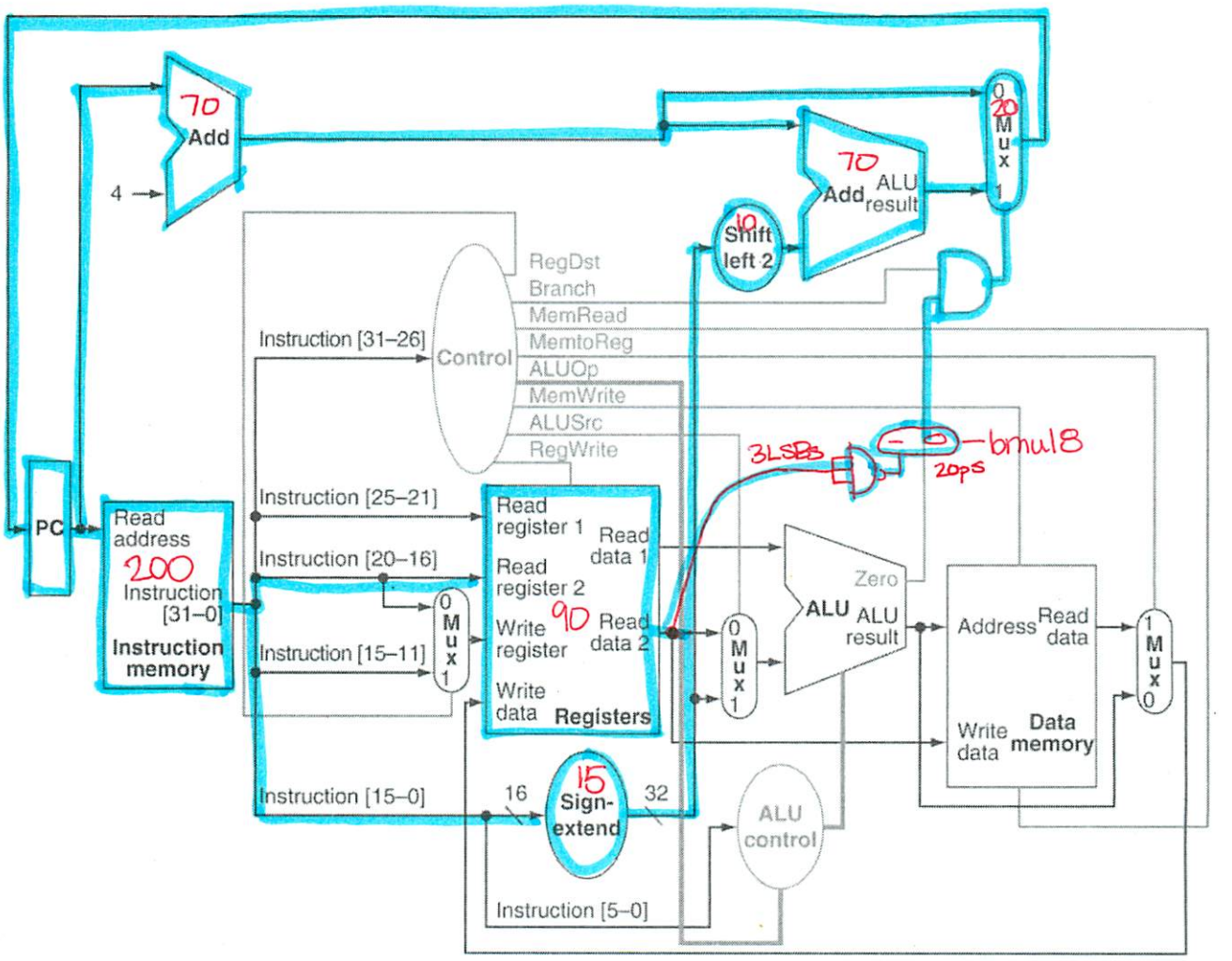
CSE 320 Fall 2014 *Homework #4 Quiz, Version B*

Name: SOLUTION *ID:*

No calculators, notes, or textbooks allowed. Show all your work for full credit.
***Time limit:** 20 mins*



a. Modify the datapath (above) and control table (below) to implement the new 'bmul8' instruction.
bmul8 rt, label # if(Reg[rt] is a multiple of 4) PC <- PC+4 + Instruction[15:0] << 0

Instr	RegDst	RegWrite	ALUSrc	Mem Read	Mem Write	Memto Reg	Branch	ALUOp	bmul8	
lw	0	1	1	1	0	1	0	00	X	
sw	X	0	1	0	1	X	0	00	X	
R-type	1	1	0	0	0	0	0	10	X	
beq	X	0	0	0	0	X	1	01	0	
bmul8	X	0	X	0	0	X	1	XX	1	

b. Assume the following timing values for the datapath components in ps. All other units are negligible.

I-Mem	Adder	Mux	ALU	Reg File	D-Mem	Sign Ext	Shift Left 2	ALU Control
200	70	20	90	90	250	15	10	30

What is the delay for the bmul8 instruction? 330ps

CSE 320 Fall 2014 *Homework #4 Quiz, Version A*

Name: SOLUTION *ID:*

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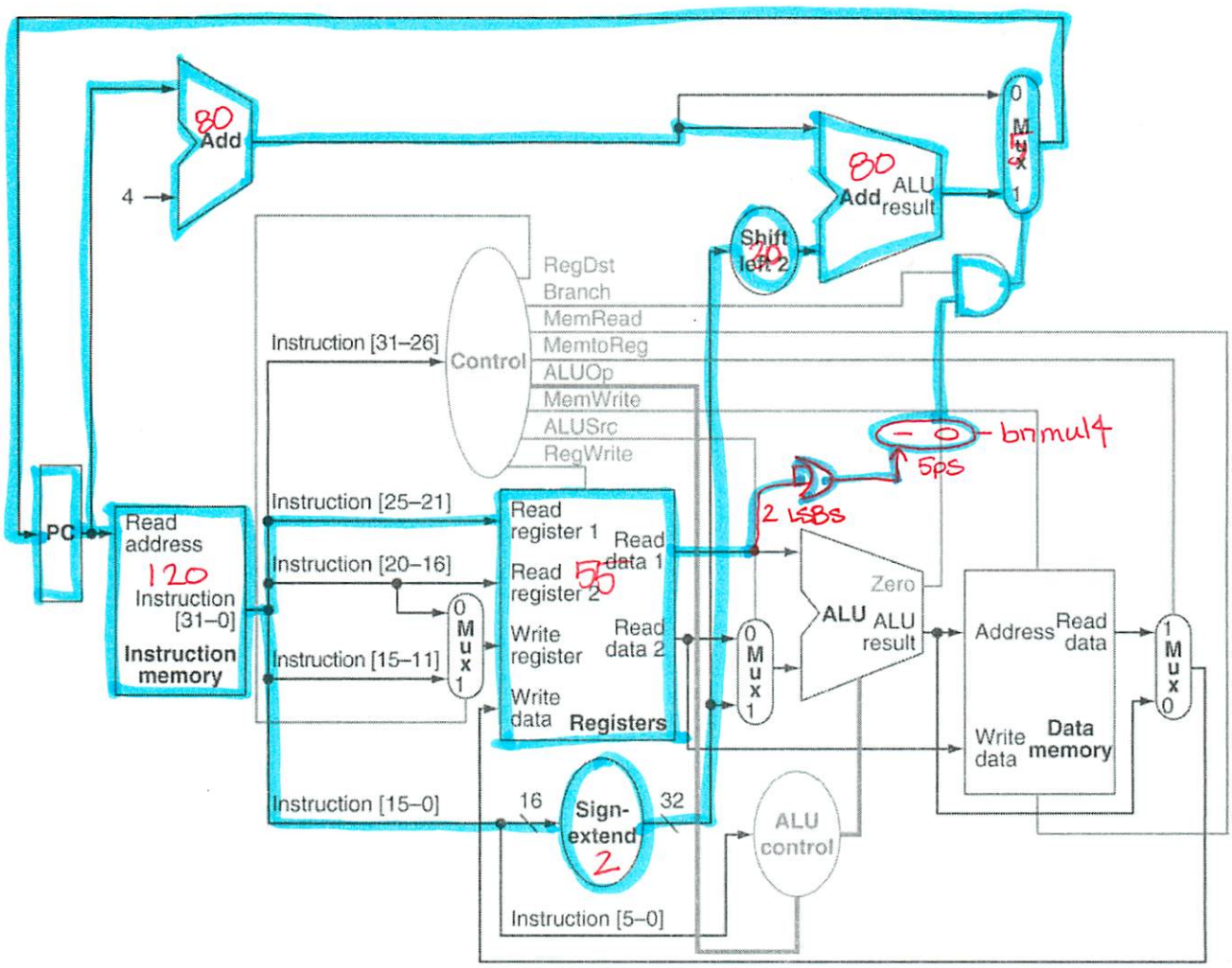
Time limit: 20 mins



a. Modify the datapath (above) and control table (below) to implement the new 'bnmul4' instruction.
bnmul4 rs, label # if(Reg[rs] is NOT a multiple of 4) PC <- PC+4 + Instruction[15:0] << 0

Instr	RegDst	RegWrite	ALUSrc	Mem Read	Mem Write	Memto Reg	Branch	ALUOp	bnmul4	
lw	0	1	1	1	0	1	0	00	X	
sw	X	0	1	0	1	X	0	00	X	
R-type	1	1	0	0	0	0	0	10	X	
beq	X	0	0	0	0	X	1	01	0	
bnmul4	X	0	X	0	0	X	1	XX	1	

b. Assume the following timing values for the datapath components in ps. All other units are negligible.

I-Mem	Adder	Mux	ALU	Reg File	D-Mem	Sign Ext	Shift Left 2	ALU Control
120	80	5	70	55	250	2	30	30

What is the delay for the bnmul4 instruction? 237 ps