Homework #6 Quiz Version B No calculators, notes, or textbooks allowed. Show all your work for full credit. Time limit: 15 mins Consider the following MIPS code

add

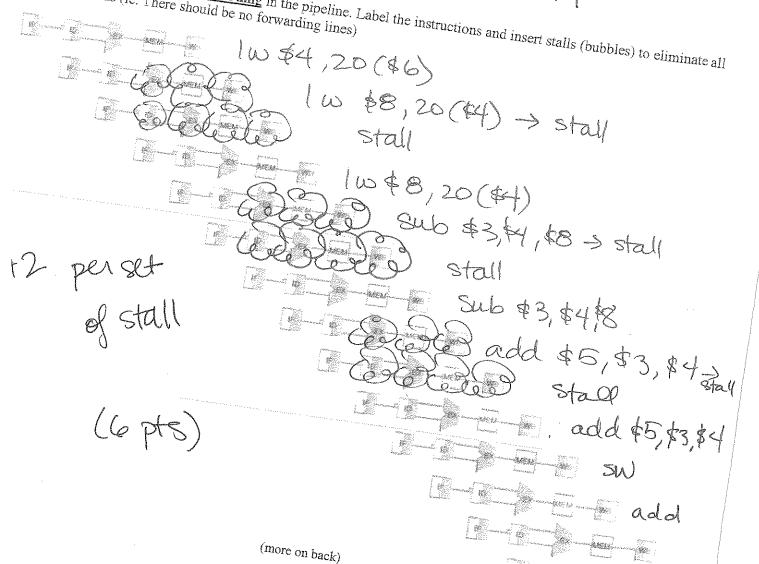
(a) What type of hazards occurs in the code above? Where do they occur?

Data hargards

lw/sub \$8

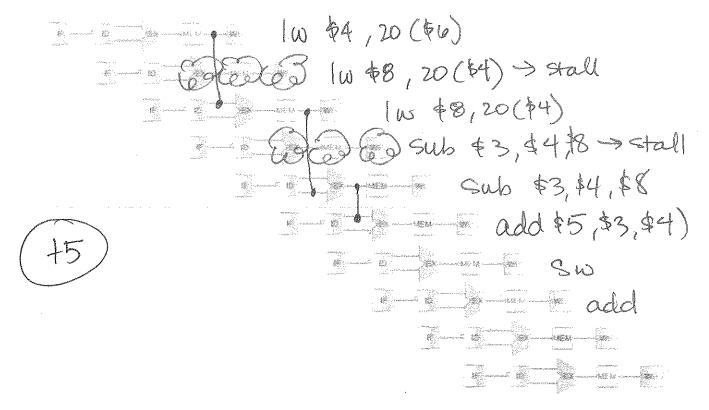
add Isub \$3

(b) Assume, there is no forwarding in the pipeline. Label the instructions and insert stalls (bubbles) to eliminate all



lw \$4, 20 (\$6) lw \$8, 20 (\$4) sub \$3, \$4, \$8 add \$5, \$3, \$4 sw \$3, 20 (\$6) add \$3, \$7, \$8

(c) Assume there is forwarding in the pipeline. Label the instructions; show the forwarding paths and/or stalls needed to execute the code.



(d) Can the code be reordered in order to improve performance? If Yes, Show how. If not, why?

No!

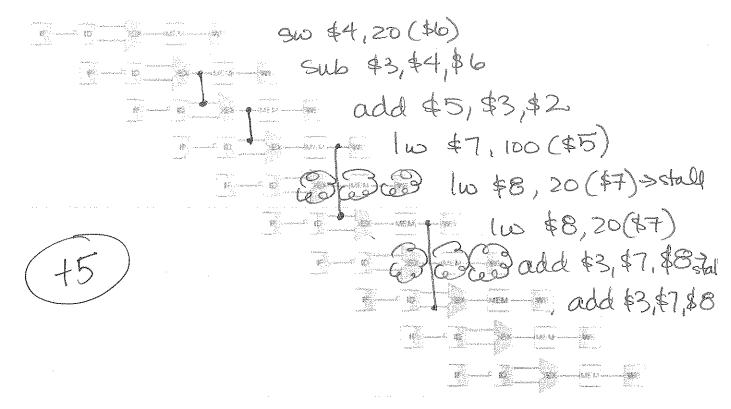
we need to insert an instr between lw/lw or lw/sub to remove stalls. All instr are dependent on the values from previents. Therefore no instr con be inserted to diminate stalls.



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No calculator <u>Time limit:</u> 1.		tbooks allowed. Show a	ll your work for	full credit.			
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(a) Wha	at type of haza	ards occurs in the code	above? Where	do they occur?		V (A)	
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		no forwarding in the production in the productio		add/w the instructions	#7- (no	ot atual halls (bubbles) to	word of
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sw \$4, 20 (\$6) sub \$3, \$4, \$6 add \$5, \$3, \$2 lw \$7, 100 (\$5) lw \$8, 20 (\$7) add \$3, \$7, \$8

(c) Assume there is forwarding in the pipeline. Label the instructions; show the forwarding paths and/or stalls needed to execute the code.



(d) Can the code be reordered in order to improve performance? If Yes, Show how. If not, why?

do h	* *	
Sub \$3, \$4,86 add, \$5, \$3 \$2		sub \$3,\$4,\$6
add, \$5, \$5 \$2	DV"	add \$5,\$3,\$2
lw \$7, 100 (\$5)		lw \$7, 100 (\$5)
Sw \$4,20 (\$6)	,	(w \$8,20 (\$7)
lw \$8, 20(\$7)		sw \$4,20(\$6)
add \$3, \$7,8		· · · · · · · · · · · · · · · · · · ·
aan 73, 7110		add \$3,\$7,\$8