國立臺灣科技大學答案卷

科目 計算机組織　任課教師 戴碧如　系所班組別 四資工二

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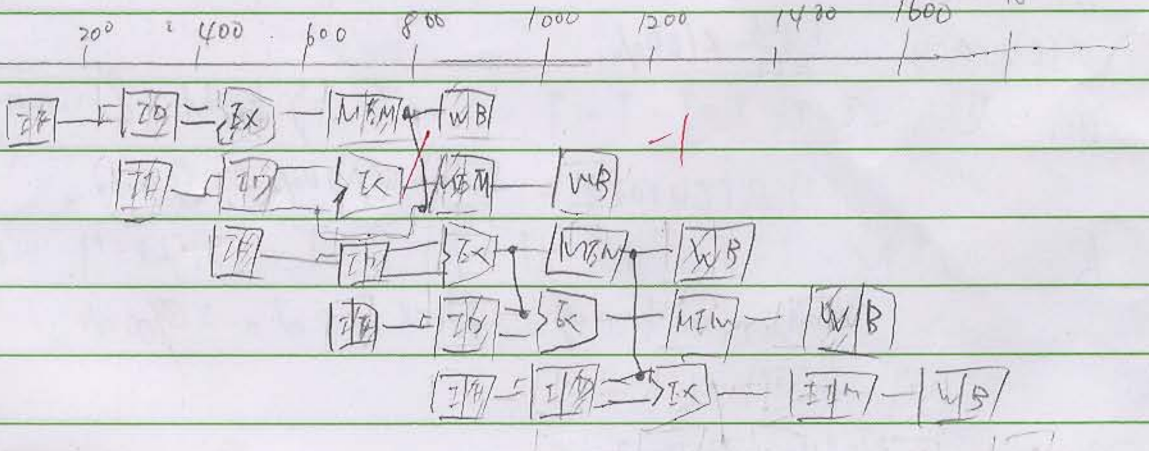
評　分	教師簽名或蓋章
94	

記分欄　從此處開始寫起。試卷用紙務須節用，非經主試認可不得續用其他紙張作答。

1. beq	a(1) = X	a(2) = 0	a(3) = X	a(4) = 0	a(5) = 1
lw	b(1) = 0	b(2) = 1	b(3) = 1	b(4) = 1	b(5) = 0
R	c(1) = 1	c(2) = 0	c(3) = 0	c(4) = 1	c(5) = 0
sw	d(1) = X	d(2) = 1	d(3) = X	d(4) = 0	d(5) = 0

-1 2. a. order　Time

lw \$10, 1000(\$20)
sw \$10 1000(\$20)
addiu \$20, \$20, -4
bne \$20, \$0, copy
lw \$10, 1000(\$20)



-1

b copy: lw \$10 1000(\$20)
Stall × 2 (因為sw在ID stage讀\$10要等lw WB完)
sw \$10, 1000(\$20)
addiu \$20, \$20, -4
Stall×2 (bne 的\$20要等 addiu WB完)
bne \$20, \$0, copy

假設沒有 taken
→ Stall
lw \$10, 1000 (\$20) (等addiu WB)

3.

Instruction	F	M_1	F	M_2	F	M_3
Loads	15%	5	30%	4	32%	3
Stores	15%	4	30%	4	28%	3
R-type	60%	4	25%	3	30%	3
Branch/jump	10%	3	15%	3	10%	3
Avg CPI	4.05		3.6		3	
MIPS	2000		2000		2000	

$CPI_{M_1} = 0.15\times5 + 0.15\times4 + 0.6\times4 + 0.1\times3 = 0.75 + 0.6 + 2.4 + 0.3 = 4.05$

$CPI_{M_2} = 0.3\times4 + 0.3\times4 + 0.25\times3 + 0.15\times3 = 1.2 + 1.2 + 0.75 + 0.45 = 3.6$

$CPI_{M_3} = 3$

$\Rightarrow MIPS_{M_1} = \frac{8.1\times10^9}{4.05\times10^6} = 2000$　$MIPS_{M_2} = \frac{7.2\times10^9}{3.6\times10^6} = 2000$　$MIPS_{M_3} = \frac{6\times10^9}{3\times10^6} = 2000$

⇒ 3台一樣快

可轉頁再寫。

95.10. 44,500 龍品

記分欄　轉頁從此開始寫起。

4 Loop: bne $a0, $a1, L1 — branch Hazard,要先設定用那種預測法來決定預先Load進來的指令

2

add $s0, $s1, $s2
addi $s3, $s0, -1 〉data Hazard, $s0 在add寫入後在 addi 會用到,要用forwarding 解決.

j Loop

L1: add $t0, $s3, $s0　// let $t0 = r

and addi

→ 假設not taken 都先Load add $s0.. 進來,一旦 Not taken 就要 nop. 然後 load add $t0, $s3 $s0 進來

5. Taken 9次, not Taken 1次 → T-T-T-T-T-T-T-T-T-N

accuracy = $\frac{right}{all} \times 100\%$

a. N-T-T-T-T-T-T-T-T-T ⇒ right = 8 wrong = 2

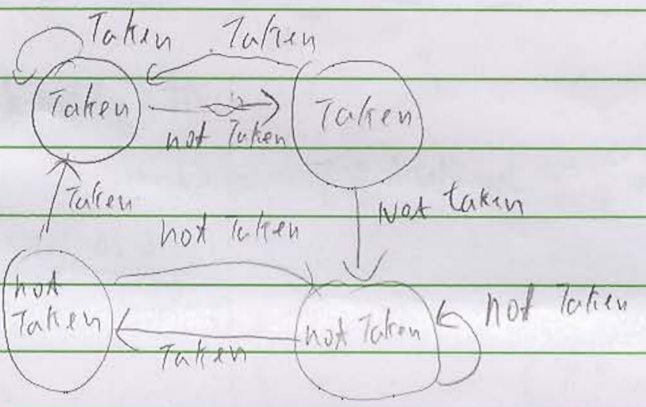
⇒ accuracy = $\frac{8}{10} \times 100\%$ = 80%

b. N-N-T-T-T-T-T-T-T-T ⇒ right = 7 wrong = 3

3

⇒ accuracy = $\frac{7}{10} \times 100\%$ = 90%

c.

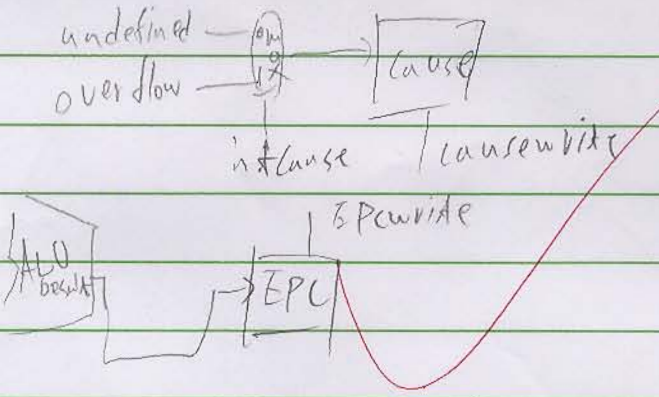


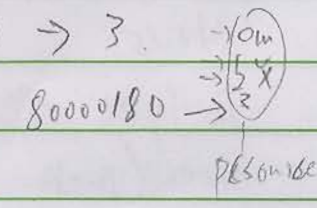
6. 把EPC放到ALUout旁, 從ALUresult拉線輸入出EPC. OP control 控制線 EPCwrite 控到EPC

放一個 Int cause的 mux 進去, 0代表 undefined, 1代表 overflow. 輸出到 cause

從 OP control 拉控制線 Causewrite 到 cause

PC的mux 加上 80000180 → 3





state 10 在 a的右邊.

Int cause = 0 (undefined) Causewrite Pcwrite PCSource = 11

ALUSrcA = 0 ALUSrcB = 01 ALUOP = 01 EPCwrite

state 11 (從7連到11) 在7右邊

Int Cause = 1 (overflow) Cause write Pcwrite PcSourse = 11

ALUSrcA = 0 ALUSrcB = 01 ALUOP = 01 EPCwrite

7.

state0	State1	State5	state7	State8	State9
IorD=0 MEMRead	ALUOP=00	Memwrite	Regwrite	ALUOP=01 PcSource=01	Pcwrite
IRwrite ALUOP=00	ALUSrcA=0	IorD=1	RegDst=1	ALUSrcA=1	PcSource=10
ALUSrcA=0 ALUSrcB=01	ALUSrcB=11		MemtoReg=0	ALUSrcB=00	
PcSource=00 Pcwrite				PCwriteCond	