CS M151B HW5 Junhong Wang (504941113)

# 4.13.1

So correct execution with nops is:

add r5, r2, r1
nop
nop
lw r3, 4(r5)
lw r2, 0(r2)
hop
or r3, r5, r3
hop
nop
SW r3, 0 (r5)

#### 4.14.1

## Resolve in Ex stage

r1, 0 (r2)

SW

lw 12,0(11) IF ID EX M bed stalled (data hazard) IF ID beg rz, ro, label z 9 NT IIF ID EX M sw becomes not (control hazard) TELD whatever instruction after on (control hazard) becomes nop lw r3 , O(r2) beg stalled (data hazard) beg r3, ro, label 1 - T ilw r2, 0(r1) beg stalled (Lata hazard) bed rz, ro, label Z 7 T

ITF ID EX IF ID IF CD EX IIF ID EX M MB TE ID I IF ID EX M MB IF ID EX M 2

IF

4.16.1

C = correct ; M = miss

always - taken

TH T TH T

CMCCM

$$\frac{3}{5}$$
 × 100 = 60 (%)

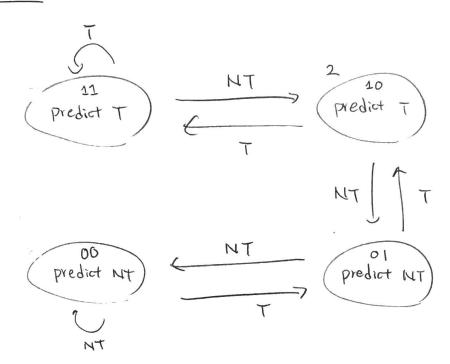
always - not - taken

T NT T T NT

n c n n c

2 × 100 = 40 T%]

4.16.2



4

Eventualy, we have C, M, C, C, M.

So the accuracy is 
$$\frac{3}{5} \times 100 = 60 \text{ [40]}$$

9 cycles

### 4.14 extra

### Resolve in ID stage

lw r2, 0(r1)

beg stalled (data hazard)

beg stalled (data hazard)

bed rz, ro, lubel2 > NT

sw becomes nop (control hazard)

Iw r3, 0(r2)

beg stalled (data hazard)

bed stalled (bota hazard)

beg r3, ro, label 1 > T

lw 12, 0(r1)

bed Stalled (data huzad)

beg stalled (data hazard)

beg rz, ro, label 2 = T

w +1, 0 (rz)

TIF ID EX M IIF ID 6 3 IF ID ( IF ID EX H WB IFILD IF ID EX MUS IF ID EX I IF ID ID EX IF ID EX