1. Saya, nama ...   NIM : ...
   mengerjakan dengan jujur tanpa kecurangan   Tanda tangan :

2. Time = $\dfrac{\text{clock cycle}}{\text{clock rate}}$

   CPU time A = $\dfrac{\text{CPU clock cycle A}}{\text{clock rate}}$

   10 sekon = $\dfrac{\text{CPU clock cycle A}}{2 \times 10^5 \dfrac{\text{cycle}}{\text{sekon}}}$

   CPU clock cycle A = $10 \times 2 \times 10^9$ cycles
   $= 20 \times 10^5$ cycles

   CPU time B = $\dfrac{\text{CPU clock cycle B}}{\text{clock rate}}$

   5 sekon = $\dfrac{1.5 \times 20 \times 10^9}{\text{clock rate}}$

   clock rate = $\dfrac{1.5 \times 20 \times 10^5}{5}$
   $= 6 \times 10^9$
   $= 6$ GHz

3. a. • Sub $to, $s3, $s4
        sll $to, $to, 2
        add $to, $to, $s6
        lw $to, 0 ($to)
        beq $s1, $s2, True
        sw $to, 0 ($s7)
        J exit
        sw $to, 32 ($s7)
        Exit

      • sll $to, $s3, 2
        add $to, $to, $s6
        lw $to, 0 ($to)
        bne $to, $s4, exit   if ($to =! $s4)
        addi $s3, $s3, 1
        J loop

b. if (g<h)

      f = g+h

    else

      f = g-h

4   a.

	C_1	C_2	C_3	C_4	C_5	C_6
lw $t0, 20 ($s0)	IF	ID	EX	MEM	WB	
sub $s0, $s1, $s2		IF	ID	EX	MEM	WB

Waktu proses = 5 + (jml instruksi - 1)

             = 5 + 1

             = 6 satuan waktu
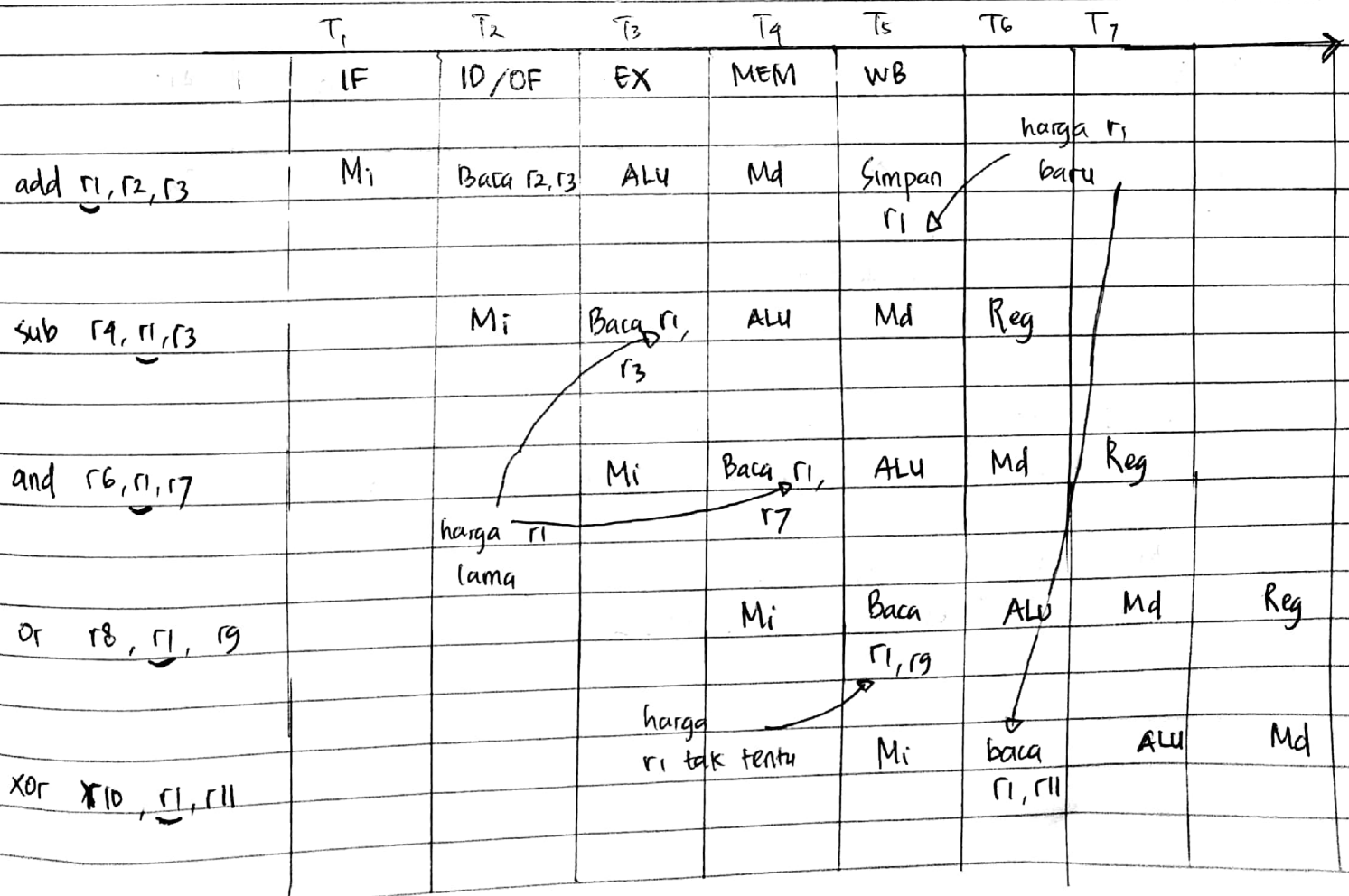
b. Contoh Data Hazard
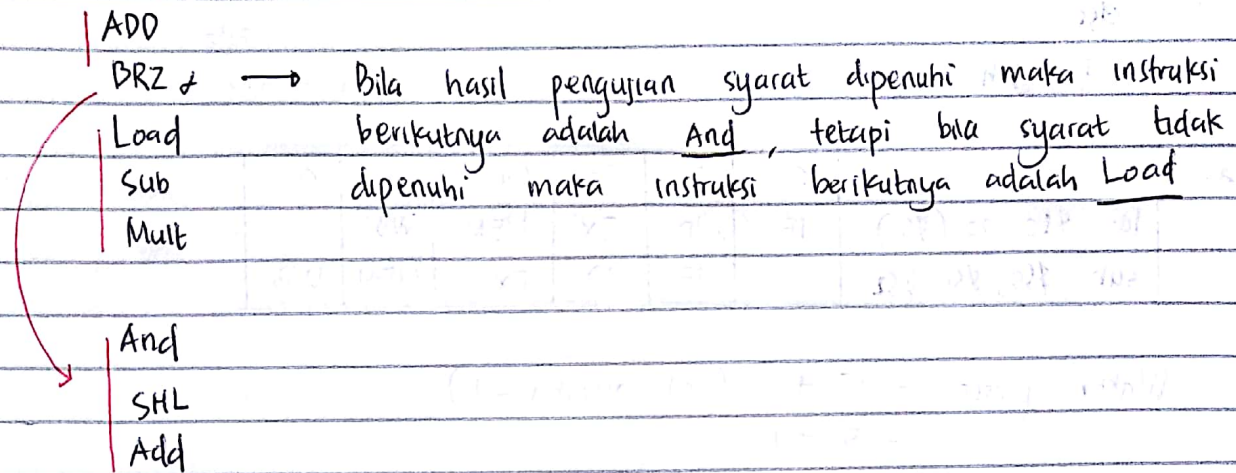
    ADD   R1, R2, R3

    SUB   R4, R1, R3

    AND   R6, R1, R7

    OR   R8, R1, R9

    XOR   R10, R1, R11

	T_1	T_2	T_3	T_4	T_5	T_6	T_7
	IF	ID/OF	EX	MEM	WB		
add r1, r2, r3	Mi	Baca r2,r3	ALU	Md	Simpan r1	harga r1 baru	
sub r4, r1, r3		Mi	Baca r1, r3	ALU	Md	Reg	
and r6, r1, r7			Mi	Baca r1, r7	ALU	Md	Reg
or r8, r1, r9				Mi	Baca r1, r9	ALU	Md	Reg
xor r10, r1, r11					Mi	baca r1, r11	ALU	Md

harga r1 lama

harga r1 tak tentu

Contoh Control Hazard

```
| ADD
| BRZ ↵ ⟶   Bila hasil pengujian syarat dipenuhi maka instruksi
| Load         berikutnya adalah And, tetapi bila syarat tidak
| Sub          dipenuhi maka instruksi berikutnya adalah Load
| Mult

| And
| SHL
| Add
```

	T_1	T_2	T_3	T_4	T_5	T_6	T_7	
Add	MEM	Reg	ALU	Mem	Reg			
BRZ		Mem	Reg	ALU	Mem	Reg		
Load			Mem	Reg	ALU	Mem	Reg	
Sub				Mem	Reg	ALU	Mem	Reg
Mult					Mem	Reg	ALU	
And						Mem	Reg	ALU

Flush
(dibatalkan)

5. i. SISMD (Single Instruction - Multiple Data)
   Contoh : Komputer vektor , Komputer dengan GPU

   2. MIMD (Multiple Instruction, Multiple Data)
   Contoh : Intel IA32 , IBM BG/L