

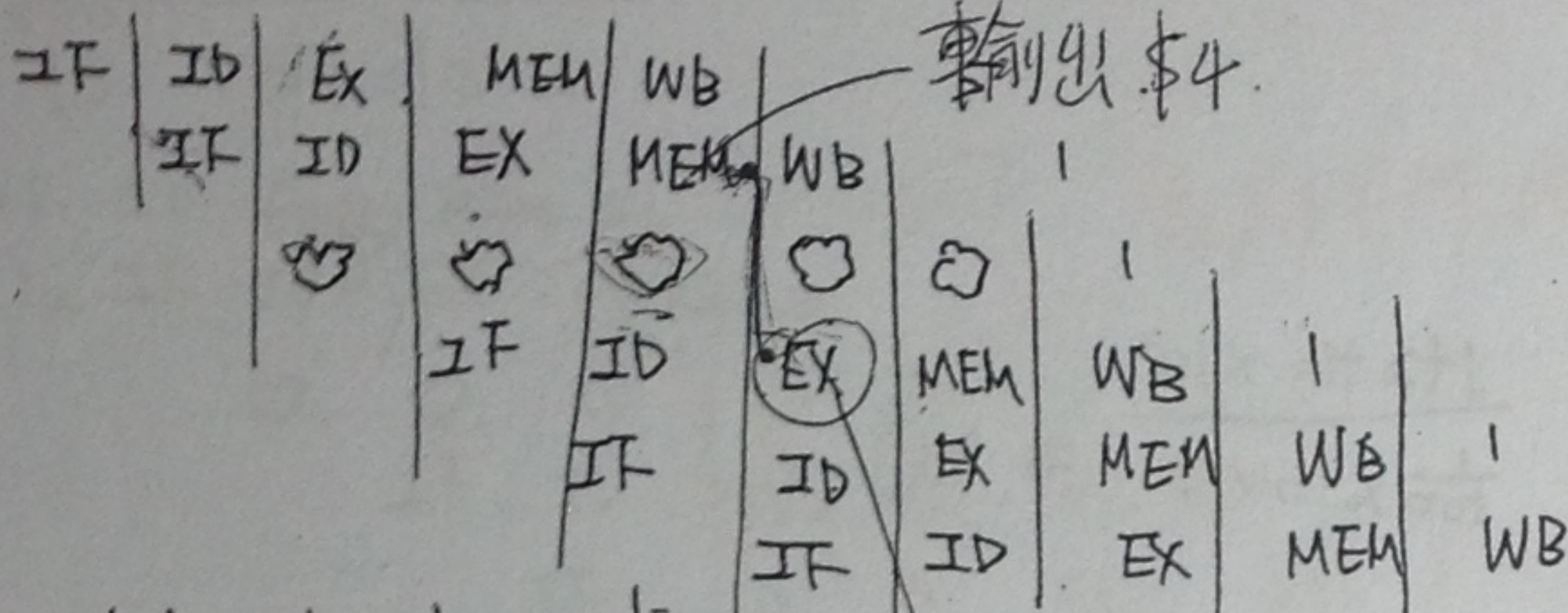
(A) F (B) F (C) T (D) T (E) F (F) F (G) F (H) F (I) T (J) F

(A)  $1120 \text{ ps} = 1\text{-Mem} + \text{Reg. Read} + \text{ALU} + \text{Reg. Write}$

(C)  $\lambda_{\text{uv}}, 2120 \text{ ps}$  : 有  $1W$  : 全加.

(E)  $lw.$   $\frac{2120}{1920}$   $D-Mem: 1000 \times 0.8 = 800$   $時間: lw 全部都要 \Rightarrow 2120$   $SW 不需要 Key, Write \Rightarrow 1900$   $\rightarrow 2120 \times 35\% + 1900 \times 15\%$   
 $500 + 220 + 180 + 800 + 220 = 1920$

10T      IF   ID   EX   MEN   WB   輸出 \$4.


$$5+5=10 \#$$

forwarding 可省一個 bubble.

(A) data . control  $\leftarrow$  branch prediction

(B) data  $\leftarrow$  Instruction scheduling

(C) data  $\leftarrow$  forwarding

(D) structural  $\leftarrow$  increasing availability of functional units

5. (A)  $\begin{matrix} T & T & T & N & T & N & T & T & T & N & T & N & T & T & T & N & T & N \\ N & T & T & T & N & T & N & T & T & T & N & T & N & T & T & T & N & T \\ \checkmark & & & \checkmark & \checkmark & \checkmark & \checkmark & & & \checkmark & \checkmark & \checkmark & \checkmark & & & \checkmark & \checkmark & \checkmark \end{matrix}$

125

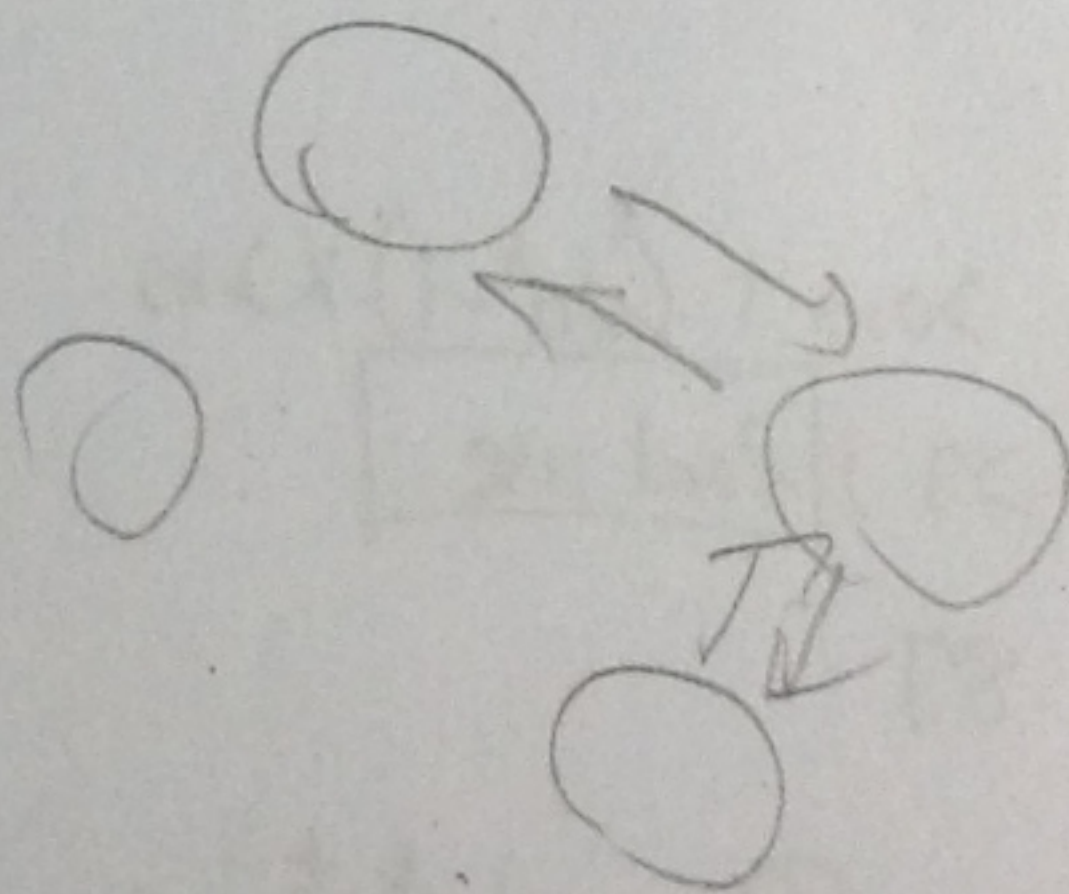
(B)

T	T	T	N	T	N	T	T	T	N	T	N	T	T	T	N	T	N
T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
			✓		✓				✓		✓					✓	✓

65

(A) ~~10ns + (N + Nf - 1) \times 2ns~~  $10ns + (N + Nf - 1) \times 2ns$

(B) ~~[REDACTED]~~



TTTTNTNTTTNTNTTTNTNT  
NTTTNTNTTTNTNTTTNT

TTTT(N)T(N)TTT(N)T(N)TT(N)T(N)TTT(N)T(N)