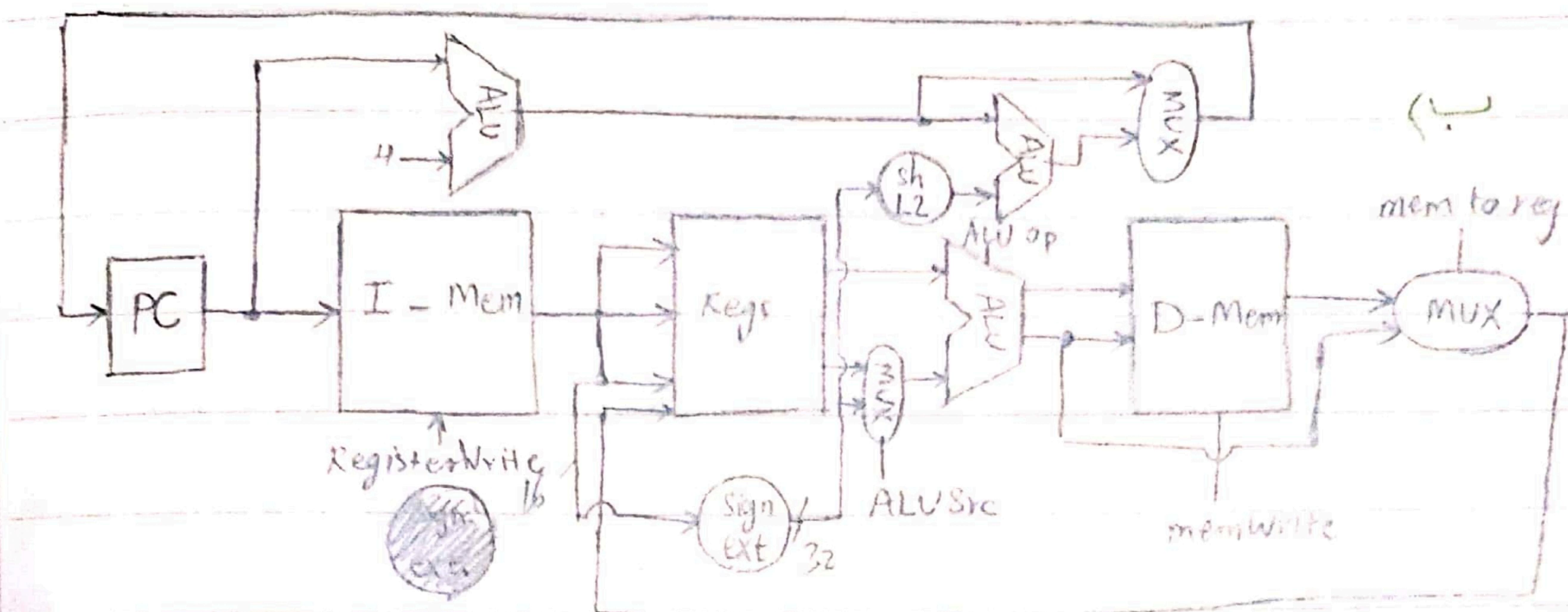


(1)

a) 200 ps

b) 950 ps : I-Mem (ازمان انتظار)



a) $200 + 15 + 70 + 70 + 20 = 315 \text{ ps}$

b) $750 + 700 + 0 + 200 + 50 = 1700 \text{ ps}$

output = instructionmem + sign ext + shift left 2 + Add unit + Mux

(2)

{ R4 pipeline: 350 ps

a) cycle time

{ R4 pipeline: 1250 ps

(iii)

{ R4 pipeline: 220 ps

b) cycle time

{ R4 pipeline: 950 ps

3 K! pipeline: 1750 ps

(c)

a) latency for lw

K! pipeline: 1250 ps

K! pipeline: 1100 ps

b) latency for lw

K! pipeline: 950 ps

(3)

	binary address	Tag	Index	Hit / Miss
3	0000 0011	0	3	Miss
180	1011 0100	11	4	Miss
43	0010 1011	2	11	Miss
2	0000 0010	0	2	Miss
191	1011 1111	11	15	Miss
88	0101 1000	5	8	Miss
190	1011 1110	11	14	Miss
14	0000 1110	0	14	Miss
181	1011 0101	11	5	Miss
44	0010 1100	2	12	Miss
186	1011 1010	11	10	Miss
253	1111 1101	15	13	Miss

: dirty bit

4

:reference bit

اپنے bit لئے نسل مرا جھبہ بھائی سلطان حافظہ است. ہاں ہوئے کر اور احمد
مودودی استادہ فلک رفتہ باشندہ آس سُولہ ماہ صدورت نے اپنی تعریف دیا۔ چالاک
دوسرا استادہ مُولیٰ استادہ مُولیٰ ایک دوبار استادہ مُولیٰ

5

$$\text{energy} = \text{I-Mem} + 2 \times \text{Reg Read} + \text{Reg Write}$$

$$= 140 + 2 \times 70 + 60 = 340 \text{ (Pj)}$$

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

load Intr = I-Mem + 2x Reg Read + D-Mem Read + Reg Write

$$= 140 + 2 \times 70 + 740 + 60 = 480(\text{p})$$

(6)

(i) add \$R₅, \$R₂, \$R₁

nop

nop

lw \$R₃, 4(\$R₅)lw \$R₂, 0(\$R₂)

nop

OR \$R₃, \$R₅, \$R₃sw \$R₃, 0(\$R₅)(ii) add \$R₅, \$R₂, \$R₁

nop

lw \$R₂, 0(\$R₂)lw \$R₃, ~~4(\$R₂)~~ 4(\$R₅)

nop

sw \$R₃, 0(\$R₅)OR \$R₃, \$R₅, \$R₃(iii) Hazard detection; PC forwarding or hijacking
Instruction & PC forwarding via a valid

(7)

$$[P_1, P_2] \rightarrow [5,3], [5,5], [6,3], [6,5] \quad (\text{الـ})$$

Sub Cycles : 7

(.)

Sub Cycles : 6

(8)

(الـ)

$$\text{private}_A = 180 \times 0.003 + (1 - 0.003) \times 5 = 5.5$$

$$\text{private}_B = 180 \times 0.006 + (1 - 0.006) \times 5 = 5.7$$

$$\text{shared}_A = 180 \times 0.012 + (1 - 0.012) \times 20 = 20.2$$

$$\text{shared}_B = 180 \times 0.003 + (1 - 0.003) \times 20 = 20$$

(.)

$$\text{private}_A = 5.5$$

$$\text{private}_B = 5.7$$

$$\text{shared}_A = 40.168$$

$$\text{shared}_B = 20$$

(9)

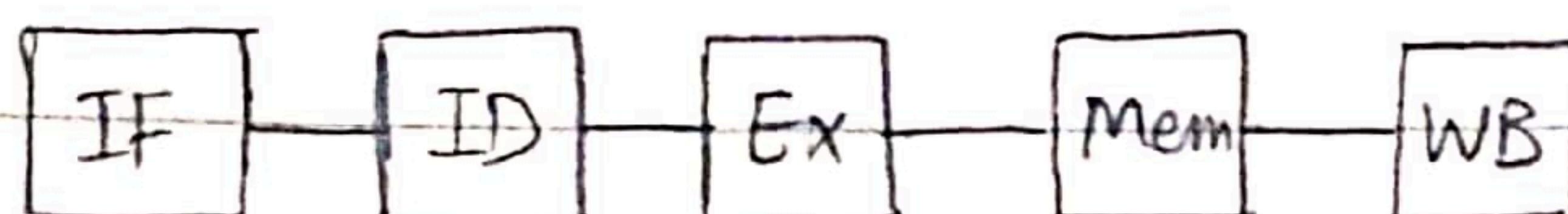
$$D_{\text{Mem}} = \text{lw} + \text{sw} \Rightarrow f = (25 + 10)\% = 35\% \quad (\text{الـ})$$

$$\text{Sign ext} = \text{add} i + \text{beg} + \text{lw} + \text{sw} = 20 + 25 + 25 + 10 = 80\% \quad (.)$$

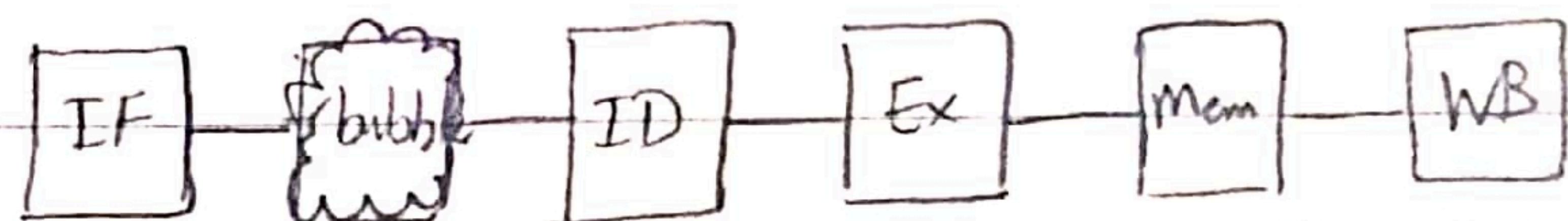
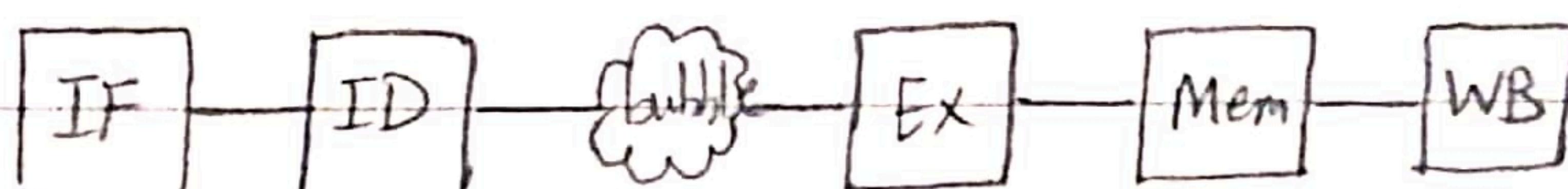
• مقدار ١٠٠% من الـ begin يُعمل بـ sign-ext

Date: / /

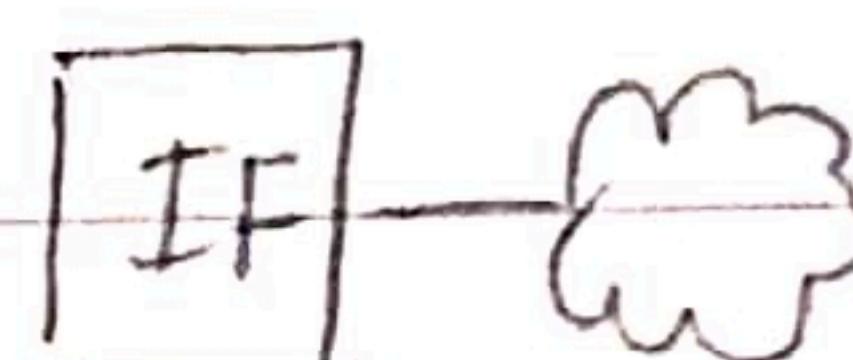
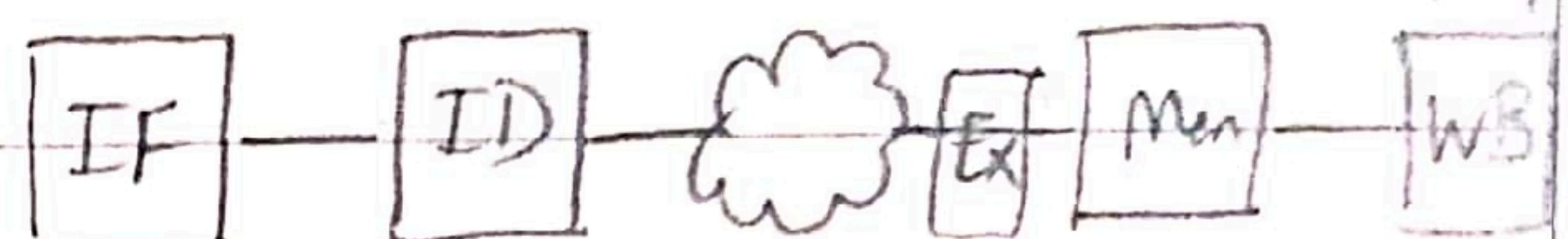
12



(i.e.)



is 6 clock



(.)

$$\text{lw} \rightarrow \frac{3}{5} \times 100 = 60\%$$

11

• این بخش خود ممکن است باشد.

12

PTE = 2^1 virtual indices $\Rightarrow 2^{31}$ entries (pages) (i.e.)

$$\text{page table size} = \text{PTE size} \times \text{PTE} = 4 \times 2^{31} = 8 \times 2^{30} = \boxed{8 \text{ GB}}$$

(مِنْ كِتَابِ الْمُؤْمِنِينَ) (۷)

Read only 6 page in Surah Al-Baqarah
وَالْأَعْجَزُ بِهِ مُؤْمِنُونَ