Arch Solutions

تمرین تئوری سری ششم

سوال اول

req	tag	index	offset	miss/hit
01000H	000000	0100000000	0000	Miss
01001H	000000	0100000000	0001	Hit
01002H	000000	0100000000	0010	Hit
59000H	010110	0100000000	0000	Miss
5900FH	010110	0100000000	1111	Hit
01003H	000000	0100000000	0011	Miss
56780H	010101	1001111000	0000	Miss
5678FH	010101	1001111000	1111	Hit
56790H	010101	1001111001	0000	Miss
56791H	010101	1001111001	0001	Hit

Total Time = HitTime + MissRate × MissPenalty = 1 + 0.5 × 40 = 21ns

سوال دوم

AMAT with using cache < AMAT without using cache

$$[(1\text{-HitRate}) \times \text{MissPenalty} \times \text{BlockSize}] + [\text{HitRate} \times \text{Chache Access Time}] < \text{MissPenalty}$$

$$[(1-0.94) \times 7 \times \text{BlockSize}] + [0.94 \times 1] < 7$$

$$0.42 \times \text{BlockSize} < 6.06$$

$$\text{BlockSize} < 14.43$$

⟹ Maximum BlockSize can be 14Bytes

سوال سوم

Virtual blocks = $\frac{virtual\ memory\ size}{page\ size} = \frac{2^{30}}{2^{10}} = 2^{20}$ ⟶ 20 bits needed

Main memory blocks = $\frac{main\ memory\ size}{page\ size} = \frac{2^{tag} \times cache\ size}{page\ size} = \frac{2^{8+14}}{2^{10}} = 2^{12}$ ⟶ 12 bits needed

TLB bits = 20 + 12 + control bits = 36bits

سوال چهارم

TLB Entries	Access	Miss/Hit
1	1	Miss
1,2	2	Miss
1,2,3	3	Miss
1,2,3,4	4	Miss
2,3,4,1	1	Hit
3,4,1,2	2	Hit
3,4,1,2,5	5	Miss
3,4,2,5,1	1	Hit
3,4,2,5,1,6	6	Miss
4,2,5,1,6,3	3	Hit
2,5,1,6,3,4	4	Hit
2,5,1,6,3,4,7	7	Miss
2,5,1,6,3,4,7,8	8	Miss
5,1,6,3,4,7,8,2	2	Hit
5,6,3,4,7,8,2,1	1	Hit
5,6,3,4,7,8,2,1,9	9	Miss

$$\text{HitRate} = \frac{hit}{access} = \frac{7}{16} = 0.4375$$