Assignment 7

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1

(1)

Since Page size is 4KB, we can know that offset is 12bits.

Therefore, VPN is the first 4 bits.

2333H:

We could know the virtual page number is 2, and we need to first visit TLB, it costs 10ns.

And since TLB is initially empty, we need to access memory to get the physical address using page table indexed with virtual page number 2, which is 233H and have valid bit 1. (cost 100ns).

Now we get the physical address, and we need to access memory again to get content at physical address in memory, which costs 100ns as well.

Therefore, it costs 10ns + 100ns + 100ns = **210ns** in total.

1555H:

We could know the virtual page number is 1, and we need to first visit TLB, it cost 10ns.

And since TLB is missed, we need to access memory to get the physical address using page table indexed with virtual page number 2, which have valid bit 0. (cost 100ns)

Then a page fault is raised, and then dealing with this exception including update TLB and Page Table. It costs 10^8ns.

Then we need to access TLB again, and get the corresponding physical address. (cost 10ns).

Now we get the physical address, and we need to access memory to get content at physical address in memory, which costs 100ns.

Therefore, it costs 10ns + 100ns + 10^8 ns + 10ns + 100ns = **100000220 ns**.

2555H

We could know the virtual page number is 2, and we need to first visit TLB, it costs 10ns.

TLB is hit and we get the physical address and visit memory, which cost 100ns.

Therefore, it costs 10ns + 100ns = **110ns**.

(2)

When accessing virtual address 1555H, we can know that a page fault is raised, and TLB is updated based on LRU.

Since we first access page 2, then page 0 is not used and we replace it with page 1.

Therefore, the corresponding page frame number is 122H.

And therefore the physical address is **122555H**.

2

stap = 0x8000 0000 0008 4000

PPN = 0x000 0008 4000

Virtual address = 0x0000 0021 2345 6789 = 0|010000100|100011010|001010110|011110001001

The VPN 1 = 0x84, VPN 2 = 0x11A, VPN 3 = 0x056 in hexidecimal.

(1)

答案即：根页表地址是**0x00 0000 8400 0000**，第**0x84**项页表项值为**0x0000 0000 2180 0011**。

(2)

答案即：二级页表地址是**0x00 0000 8600 0000**，第 **0x11A**项页表项值为**0x0000 0000 2180 0411**。

(3)

答案即：三级页表地址是**0x00 0000 8600 1000**，第 **0x056**项页表项值为**0x0000 0000 2180 0811**。

(4)

虚拟地址0x0000 0021 2345 6789对应的物理地址是：**0x00 0000 8600 2789**