CS230 DLDCA Quiz-4, Fri 08 Nov 2024, 8:30am-9:15am, Max. Marks: 10

Name: _____ Roll number: _____ House: _____

General instructions

- Write only in the space provided. Answer briefly but crisply (not lengthily or loosely).
- You are allowed to refer to your own hand-written notes only.
- Write neatly and clearly. Up to **+2 HP** for neat handwriting, neat/crisp answers.
- Answers generally have to be (briefly) explained. State any necessary assumptions.

1. Consider a machine with a 64-bit virtual address space, 32KB pages, and 64GB of main memory. The L1 cache is of size 512 KB, uses 16-word blocks, and is 4-way set associative. The processor has a 512-entry TLB with 2-way set associativity. The OS uses 32-bit PIDs (Process IDs).
   a) [2 marks] Draw and label the various address fields (virtual and/or physical) during a memory read. Assume that L1 is physically (not virtually) addressed, and that a default page-table scheme is used.

   b) [2 marks] In the above case, what is the size of the bit comparator in TLB? In L1 cache? Assume that neither the TLB nor the L1 needs to be flushed on a context switch.

   c) [1 mark] State one advantage of making the L1 cache virtually addressed.

d) [2 marks] Now suppose that the L1 cache is virtually addressed. Draw and label the various address fields (virtual and/or physical) during a memory read. Assume L1 hit.

e) [1 mark] In the case of the above virtually addressed L1 cache, and an L1 hit, what is the number of bits compared in the TLB ? Justify your answer briefly.

f) [2 marks] Continuing along with the virtually addressed cache, give two specific 64-bit virtual addresses and corresponding PIDs, with the aliasing problem. Explain briefly.

Addr1 (in hex): 0x _

Addr2 (in hex): 0x _

PID1 (in hex) : 0x _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

PID2 (in hex) : 0x _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

Reasoning:

2. **Optional, for House Points (up to 5HP):** Starting Mar 2020, for about 2 years, schools and colleges were shut in India. Illiteracy, poverty, child labour, child marriage increased as a result of the lockdown. It was portrayed as though Covid was a danger of unforeseen magnitude for children. What does a data comparison say? There were almost no children/young affected by the virus. In comparison, what is the estimated number of children dying every single day in India, due to poverty, malnutrition, and related illnesses?