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

Name: <u>Bhaskaran Raman</u>   Roll number: <u>Sample Solutions</u>   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. Short answer questions:

   a) [1 mark] Give an example of spatial locality in data memory access

      Any of: array access, elements within a structure, local variables within a function

   b) [2 marks] Distinguish between the write-back scheme versus the write-through scheme in L1 cache

      Write-back: during write-hit, word location is written only to L1 (and block marked dirty); entire block is written back to MM (or L2) when block has to be replaced

      Write-through: during write-hit, word is written to L1 as well as to MM (or L2), possible via a write-buffer

   c) [2 marks] How does VM help address the challenge of program relocation? Explain using a suitable diagram

      When a page of program moves from one physical location to another, only the VA-to-PA mapping has to change, i.e. the page-table entry has to change (see diagram from slides)

d) [2 marks] Name any one advantage and any one disadvantage of fully-associative caches

Advantage: conflict misses are reduced
Disadvantage: hit time is increased as tag size increases

e) [1 mark] In the default page-table scheme, what does a page-table store?

Physical page number and some meta-data bits; specifically it does NOT store the virtual page number

f) [1 mark] In a system using VM, what is the role of the TLB?

TLB is a cache of the page-table entries, close to the processor, so that the VA-to-PA mapping is obtained fast, without having to read the PT entry from MM

g) [1 mark] In a system using VM, what is a page-fault?

When a program accesses a memory location which has not been allocated (in PM), or when it writes to a read-only location, an exception called the page fault is triggered

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?

Estimated infant (under 1 year) mortality rate: 2000 per day

Children 2-5y: another estimated 2000 per day

Elite "scientists" supporting lockdown were disconnected from science as well as from society, under media-exaggerated fear hallucination