CSCE311 Spring, 2017 Home Work Due: 4/04/17

Name Anthony Frazier

1. Consider a 64-bit architecture machine where physical memory is 32GB. 1 2 4 6 8 16 32 64 128
    a. If we would like to run processes as big as 128GB how many bits would be required for the logical address? $1 GB = 2^{30}$ $128 GB = 2^{38}$ $\boxed{38 \text{ bits}}$

    b. If we are using pages of size 16KB, how many bits are needed for displacement into a page? $16 KB \approx 2^{14} B$ $\boxed{14 \text{ bits}}$

    c. If a single level page table is used, what is the maximum number of entries in this table? total 38 bits - page size 14 bits = 24 $\boxed{2^{24} \text{ entries}}$

    d. What is the size of this single level page table in terms of 16KB pages? 2B 4B or 8B? 4B will hold

       $\overbrace{\underbrace{\quad}_{x}\ \underbrace{\quad}_{14}}^{36}$ $(2^{26} \times 2^2)/2^{14} = \boxed{2^{14} \text{ pages}}$

    e. If a two-level page-table is used and the outer page table is an 16KB page, how many entries does it contain, maximally?

       $16KB = 2^{14}/2^4 = \boxed{2^{10} \text{ entries}}$

    f. How many bits of the logical address are used to specify an index into the inner page (page of page table)?

       $\overbrace{\underbrace{\quad}_{10}\ \underbrace{\quad}_{x}\ \underbrace{\quad}_{14}}^{38}$ $38-10-14 = \boxed{14 \text{ bits}}$

2. Consider a paging system where the page table is stored in the translation look aside buffer (TLB). The hit ratio is 95% meaning the page table entry will be found in TLB 95% of the time. The normal memory access time is t = 2.0 microseconds whereas TLB access is 0.4 microseconds.

   $EAT = (1+\epsilon)\alpha + (2+\epsilon)(1-\alpha)$

    a. When calculating the effective paged memory access time, why is the cost of a TLB miss the sum of TLB access time plus normal memory access time?

       the cost of a miss is access time plus normal memory access time because a miss will require both to provide correct info

    b. If we consider only swap-in/swap-out time and if swap-in-time 20 milliseconds and swap-out-time = 18 milliseconds, and, on the average, 80% of the pages are dirty, what is the effective page fault service time?

       $0.8(20+18) = 30.4$ ms