AOS ASSIGNMENT

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Suppose you have a two-level paging system where it takes 10 milliseconds to service a page fault and regular memory access takes 200 nanoseconds (1/5 microseconds). An average instruction takes 500 nanoseconds of the CPU time. The translation lookaside buffer hits 90 percent of the time and the user page fault rate is one page fault every 100,000 instructions.

a. what is the average time for memory fetch where there are no page faults.

Average time for memory fetch (when there are no page faults)

= Average CPU execution time + Average time for getting data (instruction operands From memory for each instruction).

= Average CPU execution time

+ Average address translation time for each instruction

+ Average memory fetch time for each instruction

According to the given data

$$= 500 + (0.9(0) + 0.1(200)) + 200$$

$$= 500 + 20 + 200$$

$$= 720ns$$

b. what is the average instruction time for all the instructions, including the one that cause page faults

Average time for memory fetch (when there is page fault)

= Average CPU execution time + Average time for getting data (instruction operands From memory for each instruction).

= Average CPU execution time
+ Average address translation time for each instruction
+ Average memory fetch time for each instruction
+ Average page fault time for each instruction

According to the given data

$$= 500 + (0.9(0) + 0.1(200)) + 200 + (1 \div 100{,}000) \times 10 \times 10^6$$

$$= 500 + 20 + 200 + 100$$

$$= 820\text{ns}$$