Quiz 4: do it yourself; use the course notes - Results

Attempt 1 of 1

Written May 31, 2024 8:17 PM - May 31, 2024 9:31 PM

Attempt Score	**7 / 7 - 100 %**
Overall Grade (Highest Attempt)	**7 / 7 - 100 %**

Question 1 — 3 / 3 points

What is the mean access time for a system with four levels of cache and a main memory? 210 memory accesses were made as follows:
80 were hits in level 1 cache
60 were hits in level 2 cache
30 were hits in level 3 cache
20 were hits in level 4 cache
The rest were hits in main memory.
The access times are:
Level 1: 3ns
Level 2: 8ns
Level 3: 20ns
Level 4: 50ns
Main memory: 200ns
Show/explain your work.

Total time = (210 x 3ns) + (130 x 8ns) + (70 x 20ns) + (40 x 50ns) + (20 x 200ns)

= 630ns + 1040ns + 1400ns + 2000ns + 4000ns

= 9070ns total time for 210 requests

Mean Memory Access Time (MMAT) = Total time / Total Number of Requests

= 9070ns / 210 requests
= 43.19ns/request

Thus MMAT is 43.19 ns / request for this system.

The correct answer is not displayed for Written Response type questions.

Question 2 **4 / 4 points**

(a) How long does it take to read a disk with 4,000 cylinders, each containing five tracks of 2048 sectors? First, all the sectors of track 0 are to be read starting at sector 0, then all the sectors of track 1 starting at sector 0, and so on. The rotation rate is 6000 RPM, and a seek takes 1 msec between adjacent cylinders and 20 msec for the worst case. Switching between any tracks of a cylinder can be done in 12 msec. (b) Re-do the question but now we don't need to ever start at sector 0; just start at any sector. Show/explain your work.

6000 RPM / (60 sec/min) -> 100 RPS -> 1/100th sec per revolution -> 10 ms per revolution

(a) Step 1: Move R/W to track 0 = worst case seek time = 20 ms
Step 2: Wait for sector 0 to spin to R/W head = 10ms/2 = 5 ms (avg case, half a rev)
Step 3: Read the current track = 10 ms
Step 4: switch to platter 2 = 12ms, wait for sector 0 to spin to the R/W head = 8ms, read platter 2 track = 10ms
Step 5: switch to platter 3 = 12ms, wait for sector 0 to spin to the R/W head = 8ms, read platter 3 track = 10ms
Step 6: switch to platter 4 = 12ms, wait for sector 0 to spin to the R/W head = 8ms, read platter 4 track = 10ms
Step 7: switch to platter 5 = 12ms, wait for sector 0 to spin to the R/W head = 8ms, read platter 5 track = 10ms
Step 8: switch to platter 1 = 12ms, move to adjacent cylinder = 1ms, wait for sector 0 to spin to R/W head = 7ms

Repeat steps 3-4-5-6-7-8 3,999 times

20ms + 5ms + 4000(10ms+30ms+30ms+30ms+30ms+20ms) = 25ms + 4000(150ms)
= 25 ms + 600,000ms = 600,025ms

Thus, it takes about 600 seconds to read the disk.

(b) Step 1: Move R/W to track 0 = worst case seek time = 20 ms
Step 2: Read the current track = 10 ms
Step 3: switch to platter 2 = 12ms, read platter 2 track = 10ms
Step 4: switch to platter 3 = 12ms, read platter 3 track = 10ms
Step 5: switch to platter 4 = 12ms, read platter 4 track = 10ms
Step 6: switch to platter 5 = 12ms, read platter 5 track = 10ms
Step 7: switch to platter 1 = 12ms, move to adjacent cylinder = 1ms

Repeat steps 2-3-4-5-6-7 3,999 times

20ms + 4000(10ms+22ms+22ms+22ms+22ms+13ms) = 20ms + 4000(111ms)
= 20 ms + 444000 = 444020ms

Thus, it still takes about 444 seconds to read the disk.

The correct answer is not displayed for Written Response type questions.

Done