Name: _____ USC ID: _____

Quiz 2: Storage Systems (10 points), 10 minutes (morning)

Consider a hard disk with maximum seek time of 12ms, patters rotating at 1000RPM, (maximum) transmission bandwidth of 100MB/sec. Assume 4KB per block.

1. [7 points] Compute the completion time and actual bandwidth for sequential access of 100MB of data. Show your work (i.e., how you derive the answer).

   Completion Time = $T_{seek} + T_{rot} + T_{transfer}$

   Avg. Seek Time = 1/3*Max Seek Time = 1/3*12 = 4ms

   Time for 1 rotation = 60000 ms / 1000 rotations = 60 ms
   Rotational Latency = 60/2 = 30ms

   Transfer Time = 100 MB/100 MB * 1000 = 1000ms

   Therefore, completion time = $T_{seek} + T_{rot} + T_{transfer}$
   = 4+30+1000
   = 1034 ms

   Actual Bandwidth = |w|/completion time = 100MB/1034ms = 96.711 MB/s

2. [3 points] Which of the time: latency or transmission time, dominates the completion time? What if the workload is changed to "random access of 100MB of data"? Explain your answer.

   Transfer time dominates the completion time since sequential access of data, thus no rotation/seeking needed once we find start point.

   If workload is changed to random access of 100 MB of data:

   No. of blocks to be transferred = 100/4*1000 = 25000

   Completion time = 25000 * (4 + 30 + 4/100) = 850000 + 1000 = 851000

   850000>>1000, therefore latency time dominates in this case since multiple seeking/rotation needed.