Name: _____ USC ID: _____

Quiz 1: Storage Systems (10 points), 10 minutes

Consider a hard disk with maximum seek time of 15ms, patter speed of 7200RPM, (maximum) bandwidth of 100MB/sec. Assume 4KB per block.

1. [5 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).

$$Average\ seek\ time = T_{seek} = \frac{1}{3} * \max seek\ time = \frac{1}{3} * 15ms = 5ms$$

$$Time\ for\ full\ rotation\ is\ \frac{60{,}000ms}{7200rot} = 8.33ms/rotation$$

$$Average\ rotation\ latency = T_{rot} = \frac{1}{2} * 8.33ms = 4.17ms$$

$$Transfer\ time = T_{trans} = \frac{100MB}{100MB/sec} = 1000ms$$

$$T = T_{seek} + T_{rot} + T_{trans} = 5ms + 4.17ms + 1000ms = 1009.17ms$$

$$Actual\ bandwidth = \frac{100MB}{1009.17ms} = 99.09MB/sec$$

2. [5 points] Compute the completion time and actual bandwidth for random access of 100MB of data. Show your work.

$$\#\text{Blocks} = \frac{100MB}{\frac{4KB}{block}} = 25{,}600\text{blocks}$$

$$T' = \#Blocks * (T_{seek} + T_{rot} + T_{trans}') = \frac{100MB}{\frac{4KB}{block}} * \left(5ms + 4.17ms + \frac{4KB}{100MB/sec}\right)$$

$$= 235.75sec$$

$$Actual\ bandwidth = \frac{100MB}{235.75sec} = 0.424MB/sec = 434.36KB/sec$$