Name: _____ USC ID: _____

Quiz 1: Storage Systems (10 points), 15 minutes

Consider a hard drive with the following characteristics:

Number of cylinders	512
Number of platters	8
Number of heads per platter	2
Number of sectors per track	256
Size of sector	4KB
Number of sectors per block	1
(Maximum) bandwidth	100MB/s
Rotational speed	**7,200RPM**
Maximum seek time	15ms

a) [2 points] What is the capacity of the hard drive? Show your deviation.

Cylinders*Heads*Sectors*SectorSize = 512*(2*8)*256*4kb = 8Gb

b) [8 points] Consider a workload w of transferring 100MB of data which are **sequentially** located on the drive.

a. [4 points] How long does it take for the workload w to complete? Show your derivation.

T_{seek} = 15ms * (1/3) = 5ms
T_{rotate} = (60,000ms/7200r) * (1/2) = 4.17ms
$T_{transfer}$ = 100mb/(100mb/s) = 1s = 1000ms
$T_{completion} = T_{seek} + T_{rotate} + T_{transfer}$ = 1009.17ms

b. [2 points] Which component (latency or transmission time) accounts for most of the time? Explain your answer.

Transmission time. When data are sequentially located on the drive, hard drive only need to seek and rotate to the right place for one time. So it is transmission time that dominate the completion time.

c. [2 points] What is the **actual** bandwidth of the drive for the workload w? Show your derivation.

100mb/1.00917s = 99.1mb/s