Deliverable: Magnetic discs

Submission form

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Exercise 1

A file takes 1,342,177,280 bytes. Give its size using both decimal and binary prefixes. Make sure you apply the recommendations given in Annex *Style matters* at the end of the task instructions.

With decimal prefixes	1,342,177,280/10^3= 1342177.28 *kB* 1,342,177,280/10^6=1342 .18 *MB* 1,342,177,280/10^9=1.34 *GB*
With binary prefixes	1,342,177,280/2^10=1310720 *KiB* 1,342,177,280/2^20= 1280 *MiB* 1,342,177,280/2^30=1,25 *GiB*

Exercise 2

A given hard disk has 2 sides and a linear track density of 185,000 tpi. The innermost diameter is 0.8", and the outermost is 2.8".

2.1 What is the amount of useful surface in the disk? Give the result in square inches (in^2).

Innermost radius = 0.4

Outermost radius = 1.4

Useful surface = 2*((π *1.4^2)-(π *0.4^2))= 11.31 in^2

Result: ***in^2***

2.2 How many cylinders and tracks does the disk contain?

N cylinders = (1.4-0.4)*185000= 185000 cylinders

Tracks = 2*185000 = 370000

Result: 185000 **cylinders, and** 370000 **tracks**

Exercise 3

Calculate the capacity of the disk of exercise 2 assuming CAV format with 1546 sectors/track and a sector size of 4096 bytes.

Capacity (CAV) = H × C × S × B = 2*185000*1546*4096=2.34*10^12

Result: 2.34*10^12 ***Bytes***

What is the areal density of the disk? Give it both in *Mb/in*^{2} and *Gb/in*^{2}.

Areal density = (8*2.34*10^12)/11.31 = 1655,172 Gb/in^2

1655,172 Gb/in^2 *10^3 =1655172

Result: 1655172 ***Mb/in*^{2}**

Result: 1655.172 ***Gb/in*^{2}**

Exercise 4

Calculate the capacity of the disk of exercise 2, assuming a linear density of 185,000 tpi and ZCAV format with the following distribution of sectors of 4096 bytes.

Zone	Limits (ID – OD)	Sectors/track
0	2.3" – 2.8"	2706
1	1.8" – 2.3"	2319
2	1.3" – 1.8"	1933
3	0.8" – 1.3"	1546

Calculate the capacity of the disk.

Capacity (ZCAV) = H × Cz × ∑Sz × B = 2* (185000/4)*(2706+2319+1933+1546)*4096= 3.22*10^12

Result: 3.22*10^12 ***Bytes***

What is the areal density of this disk? Give it both in *Mb/in*^{2} and *Gb/in*^{2}.

Areal density= (8*3.22*10^12)/11.31=2277.63041 Gb/in^2 = 2277630.41

Result: 2277630.41 ***Mb/in*^{2}**

Result: 2277.63 ***Gb/in*^{2}**

Exercise 5

Consider the disk described in exercise 4 rotates at 7,140 rpm. The average seek time is 8 ms, and the track-to-track seek time is 0.7 ms. Calculate:

5.1 The average access time.

Avarage acces time = Av. seek time + Av.rotational lantency

Avarage acces time = (8.4/2) + 8= 12.2 ms

Result: 12.2 ***ms***

5.2 The internal transfer speed for each zone.

Zone 0: (2706*1096)/8,4*10^-3 = 1319.50 Mb/s

Zone 1: (2319*1096)/8,4*10^-3 = 1130.79 Mb/s

Zone 2: (1933*1096)/8,4*10^-3 =942.57 MB/s

Zone 0: (1546*1096)/8,4*10^-3 =753.86MB/s

Results: **Zone 0:** 1319.5 ***MB/s*** **Zone 1:** 1130.79 ***MB/s***

Zone 2: 942.57 ***MB/s*** **Zone 3:** 753.86 ***MB/s***

5.3 The average time it takes to read a 120 kB file stored in correlative sectors of the same track. Consider two cases: when the track is in zone 0 and when it is in zone 3.

Zone 0:

Average read time = Average access time + Transfer time

Avarage acces time = 12.2 ms

Transefer time = (8.4/2706)*(120/4096)= 0.0931 ms

Avarage read time = 12.2 + 0.0931= 12.29

Result: 12.29 ***ms***

Zone 3:

Transfer time = (8.4/1546)*(120/4096)= 0.163 ms

Avarage read time = 12.2 + 0.163= 12.363 ms

Result: 12.363 ***ms***

5.4 The average time to read a 120 kB file stored in randomly distributed sectors of cylinders located in zone 0. Assume the average seek time within a given zone is the average seek time divided by the number of zones, i.e., 8 / 4 = 2 ms.

Read time = sectores * avarage read time *avarage time

pos = 30 *(12.29)*2=737.4

Result: 737.4 ***ms***

5.5 The time for reading an 8,000 MB file, assuming it is **optimally** stored in zone 0 (with all the optimisations described in Section 4).

Read time = 12.2 + (1953125 / (2706 · 2))+(8000/ 4096)*0.093=181905.525ms

Result: 181905.5 ***ms***