

## problem 1:

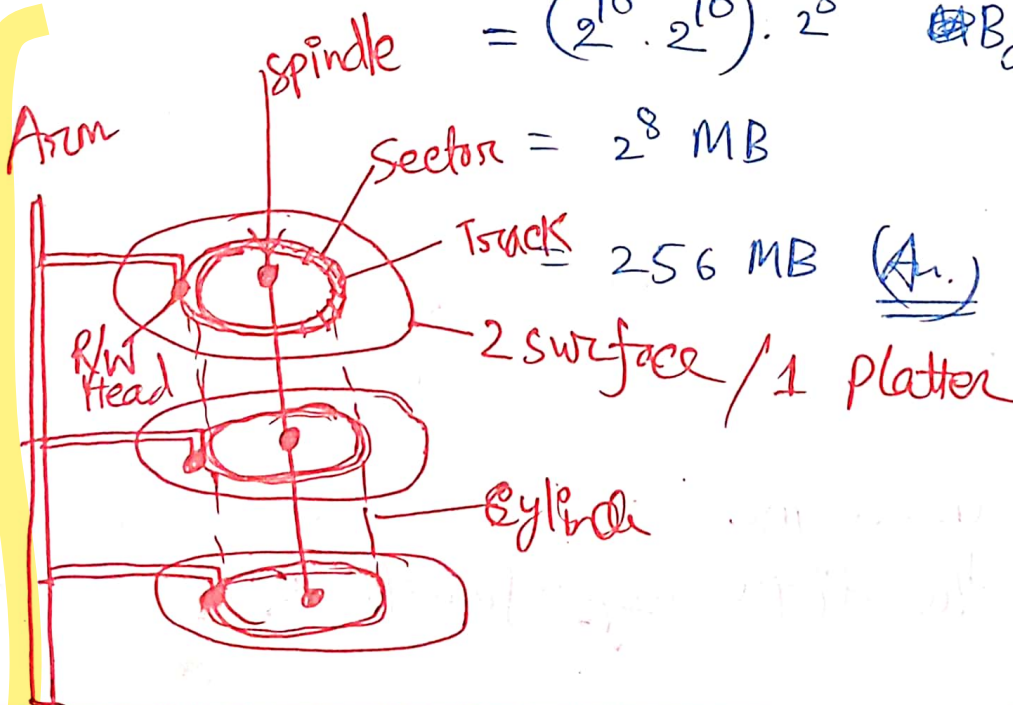
Consider a disk pack with the following specifications - 16 surfaces, 128 tracks per surface, 256 sectors per track and 512 bytes per sector.

Q What is the capacity of disk pack?

$$\begin{aligned}\text{Capacity} &= (\text{surface} \times \text{tracks} \times \text{sectors} \times \text{bytes}) \\ &= (16 \times 128 \times 256 \times 512) \text{ bytes} \\ &= (2^4 \times 2^7 \times 2^8 \times 2^9) \\ &= 2^{28} \text{ bytes}\end{aligned}$$

$$= (2^{10} \cdot 2^{10}) \cdot 2^8 \text{ Bytes}$$

$$\begin{aligned}2^{20} \text{ byte} \\ = 1 \text{ MB}\end{aligned}$$



Filwel<sup>TM</sup> Gold & Filwel<sup>TM</sup> Silver

(II) What is the number of bits required to address the sector?

$$\begin{aligned}\text{Total sector} &= (16 \times 128 \times 256) \text{ sectors} \\ &= (2^4 \times 2^7 \times 2^8) \text{ " } \\ &= 2^{19} \text{ sectors}\end{aligned}$$

$\therefore$  required bits = 19 bits (Ans.)

(III) If the format overhead is 32 bytes per sector what is the formatted disk space?

$$\begin{aligned}\text{Formatting overhead} &= (16 \times 128 \times 256) \times 32 \text{ bytes} \\ &= 2^{24} \text{ bytes} \\ &= 2^4 \text{ MB} \\ &= 16 \text{ MB}\end{aligned}$$

$$\begin{aligned}\therefore \text{Formatted disk space} &= (256 - 16) \text{ MB} \\ &= 240 \text{ MB} \quad \text{(Ans.)}\end{aligned}$$

Format overhead includes structures & metadata required for the disk's ~~cap~~ functionality.

✓ (iv) If the format overhead is 64 bytes per <sup>sector?</sup> how much amount of <sup>Byte</sup> ~~money~~ is lost due to <sup>formatting?</sup>

$$\begin{aligned}\text{Formatting overhead} &= (16 \times 128 \times 256) \times 64 \text{ Bytes} \\ &= 2^{25} \text{ Bytes} \\ &= 2^5 \text{ MB} \\ &= 32 \text{ MB} \quad (\text{lost 32 MB})\end{aligned}$$

(v) If the diameter of innermost track is 21 cm, what is the maximum recording density?

$$\begin{aligned}\text{Capacity of track} &= 256 \times 512 \text{ bytes} \\ &= 2^{17} \text{ bytes} \\ &= 128 \text{ KB}\end{aligned}$$

$$\begin{aligned}\text{perimeter} &= 2 \times \pi \times r \\ &= 3.1416 \times 21 \text{ cm} \\ &= 65.94 \text{ cm}\end{aligned}$$

$$\begin{aligned}\therefore \text{maximum recording density} &= (128 \text{ KB} / 65.94 \text{ cm}) \\ &= 1.94 \text{ KB/cm}\end{aligned}$$



(vi) If the diameter of innermost track is 21 cm with 2 KB/cm, what is the capacity of one track?

$$\text{perimeter} = 2\pi r = 65.94 \text{ cm}$$

$$\text{capacity} = (65.94 \times 2) \text{ KB}$$

$$= 131.88 \text{ KB}$$

$$\approx 132 \text{ KB} \quad (\text{Ans.})$$

(vii) If the disk is rotating at 3600 RPM, what is the data transfer rate?

$$\text{Rate} = 16 \times (256 \times 512) \times \frac{3600}{60}$$

$$= 2^4 \times 2^8 \times 2^9 \times 60$$

$$= 2^{21} \times 60 \text{ byte/sec}$$

$$= 2^{20} \times 2^1 \times 60$$

$$= 120 \text{ MBps} \quad (\text{Ans.})$$