Chapter 16 Exercises

Akshatha Vasant Hegde

1. A manufacturer wishes to design a hard disk with a capacity of 30GB or more (1GB=2^30 bytes) If the technology used to manufacture the disks allow 1024-byte sectors, 2048 sectors/track and 4096 track/platter, how many platters are required?

Solution) Hard disk capacity - 30GB

No. of bytes/sector - 1024

No. of sectors/track = 2048

No of tracks/platter - 4096

Disk capacity = no. of platters × no of bytes/sector × no of sectors/track

$\qquad\qquad\qquad\qquad\qquad\qquad\qquad$ × no of tracks/platter

$\qquad\qquad$ = no. of platters × 1024 × 2048 × 4096

Disk capacity - 30GB = no. of platters × 2^{33}

no of platters × 2^{33} = 30GB

no. of platters × 2^{33} = 30 × 2^{30}

no of platters $= \dfrac{30}{2^3} : \dfrac{30}{8} = 3.75$

∴ No of platters are 4.

2. A hard disk with one platter rotates at 15000 r/min and has 1024 tracks, each with 2048 sectors. The disk head starts at track0 (track is numbered 0-1023) The disk then never receives a request to access a random sector on a random track. If the seek time of the disk head is 1ms for every 100 tracks it must cross.

b) What is the average rotational latency

Solution) rotation speed = 15000 r/min = 250 r/sec

Average latency $= \frac{1}{2} \times \dfrac{1}{\text{rotational speed}}$

$$= \frac{1}{2} \times \frac{1}{250 \text{ r/sec}} \quad = 0.002$$

$$= 2 \text{ msec}$$

c) What is the transfer time for the sector?

number of sectors = 2048 sectors/track.

rotation speed = 15000 r/min = 250 r/sec

Transfer time $= \dfrac{1}{\text{number of sectors} \times \text{rotational speed}}$

$$= \frac{1}{2048 \text{ sectors/track} \times 250 \text{ r/sec}}$$

$$= \frac{1}{512,000}$$

$$= 0.001953 \text{ msec}$$