

Answer on Question #44427 – Math - Other

Problem.

A hard disk system has the following parameters:

Number of tracks=500

Number of sectors/track=100

Number of bytes/sector=500

Time taken by the head to move from one track to adjacent track=1ms

Rotation speed=600 rpm

What is the average time taken for transferring 250 bytes from the disk?

(A)300.5 ms (B) 255.5 ms (C)255 ms (D)300 ms

Solution.

The time to transfer 250 bytes from the disk equals:

the average seek time + the average rotational latency + the transfer time for 250 bytes.

The average seek time equals:

$$\frac{1}{2} \times \text{number of tracks} \times \text{time taken to move from one track to adjacent track}$$

or

$$\frac{1}{2} \cdot 500 \cdot 1 \text{ ms} = 250 \text{ ms}$$

The average rotational latency equals is the time required for $\frac{1}{2}$ of a full rotation:

$$\frac{1}{2} \cdot \frac{1}{600} \text{ m} = \frac{1}{2} \cdot \frac{60}{600} \text{ s} = \frac{1}{20} \text{ s} = 0.05 \text{ s} = 50 \text{ ms.}$$

There are 100 sectors. Each sector has capacity 500 B, so we need to read half of sector it equals to time required for $\frac{1}{100} \cdot \frac{1}{2} = \frac{1}{200}$ of a full rotation:

$$\frac{1}{200} \cdot \frac{1}{600} \text{ m} = \frac{1}{200} \cdot \frac{60}{600} \text{ s} = \frac{1}{2000} \text{ s} = 0.0005 \text{ s} = 0.5 \text{ ms.}$$

Therefore time to transfer 250 bytes from the disk equals $250 + 50 + 0.5 \text{ ms} = 300.5 \text{ ms}$.

Remark. The formula

$$\frac{1}{3} \times \text{number of tracks} \times \text{time taken to move from one track to adjacent track}$$

for average speed is much more correct, but there are no answer $166\frac{2}{3} + 0.5 + 50 = 217\frac{1}{6} \text{ ms}$ between proposed.

Answer: 300.5 ms.