CS 342 Homework 2

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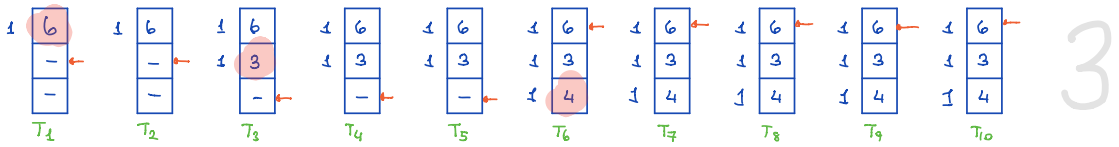
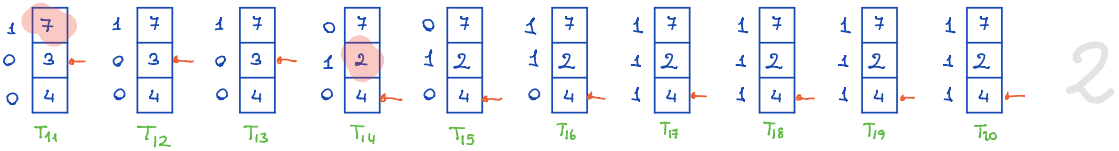
Q1 :



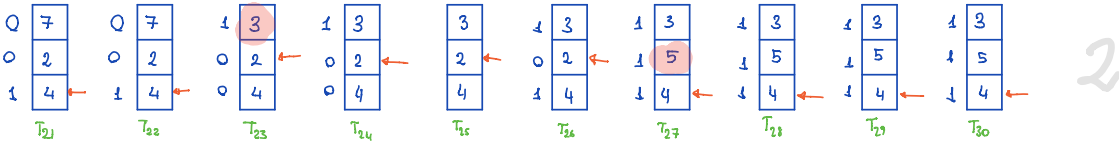
3

→ 10 Ticks, reference bits cleared



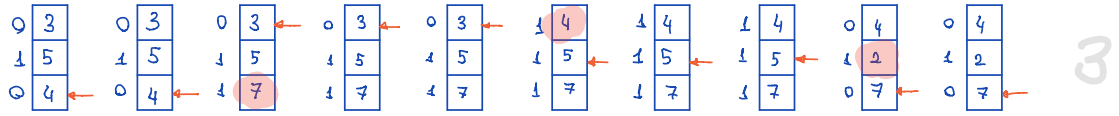
2

→ 10 Ticks, reference bits cleared



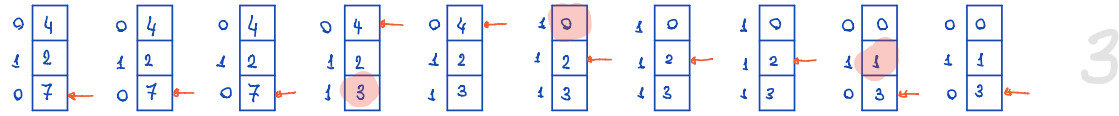
2

→ 10 Ticks, reference bits cleared



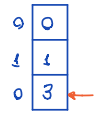
3

→ 10 Ticks, reference bits cleared



3

→ 10 Ticks, reference bits cleared



13 page faults total.

Q2.

Page size 64, page offset is 6 bits.
Page size; 8 bits
Segment size 2 bits
} 16 bits total

a) 0x06B2

b) 0x12E4

c) 0x1348

d) offset > length. Traps to OS.

e) 0x030A

f) 0x0B48

Q3.

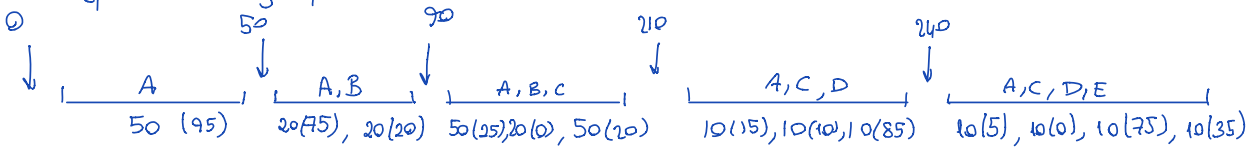
```
Semaphore smoke [3] = {0,0,0};

Semaphore table = 1;


agent_runner ()
{
    int rand;
    wait (table);
    i = rand (3);   //Select random i between [1,3]
    signal (smoke [i]);
}

Smoker_runner (int smoker_no)
{
    wait (smoke [smoker_no]);
    signal (table); // smoker is done, signal table so agent can run.
}
```

Q4: assuming $q = 1$



B finishes at 109

C finishes at 268

5(0), 5(70), 5(30)

A finishes at 286

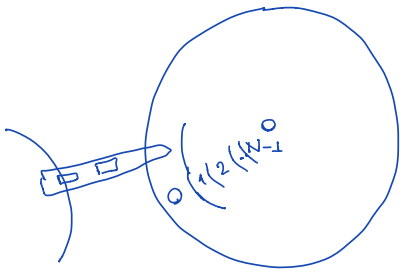
30(40), 30(0)

E finishes at 348

D finishes at 388

Q5.

a)



Assume head is positioned at T.
Assume there are N tracks.

We first choose a track to start on.

↳ N tracks.

Then we select another track to seek from our chosen track.

↳ N * N. (I included the same track because the head may simply be on that track as a coincidence).

Seek length will be denoted by L.

$$E(x) = \frac{N}{N^2} = \begin{cases} 0 & N - L \overset{5}{\leq} T \overset{5}{} \\ 2/N & N-L > T \geq L \text{ and } 0 \leq k < \frac{N-1}{2} \\ 1/N & \text{otherwise} \end{cases}$$

b)

$$E(x) = \frac{\text{Number of tracks to choose from}}{\text{Number of ways to choose and seek a track}} = \frac{N}{N^2}$$, or if we can't seek the track we're on;

$$= \frac{2(N-L)}{N^2}$$

c) Number of tracks jumped over will be denoted by S;

$$E(x) = \sum_{0}^{N-1} S \frac{2(N-S)}{N^2}$$

S: We will be jumping over S tracks on every one of our ways to seek.

$\Rightarrow$ after reducing this in MATLAB;

$$= \frac{N^2 - 1}{3N}$$

Q6.

Block size = 4KB

Disk ptr size = 8 bytes

1KB = 2^{10} Bytes. ; 4KB = 2^{12} bytes

1MB = 2^{20} bytes ⟶ $2^{20} / 2^{12} = 2^8$ index blocks

100MB = $10^2 \times 2^{20}$ bytes ⟶ $10^2 \times 2^{20} / 2^{12} = 2^8 \times 10^2$ index blocks

4GB = 2^{32} bytes ⟶ $2^{32} / 2^{12} = 2^{20}$ index blocks

1TB = 2^{40} bytes ⟶ $2^{40} / 2^{12} = 2^{28}$ index blocks

Maximum file size;

64 bits of disk pointer size.

$2^{64} \times 4KB = 2^{64} \times 2^{12} = 2^{76}$ bytes.

For a 4GB file;

?