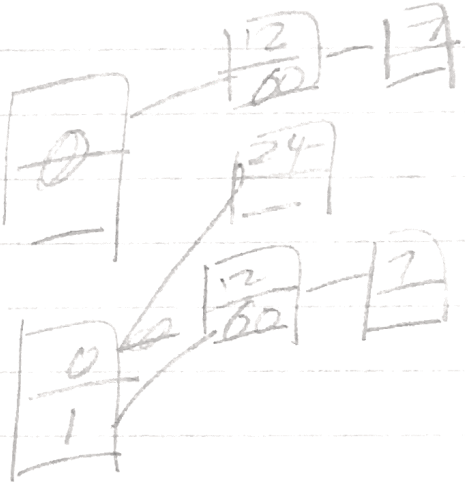
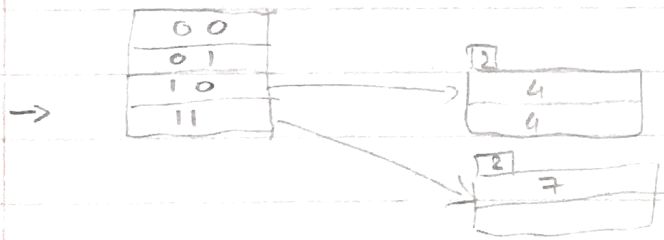
2 search / bucket.

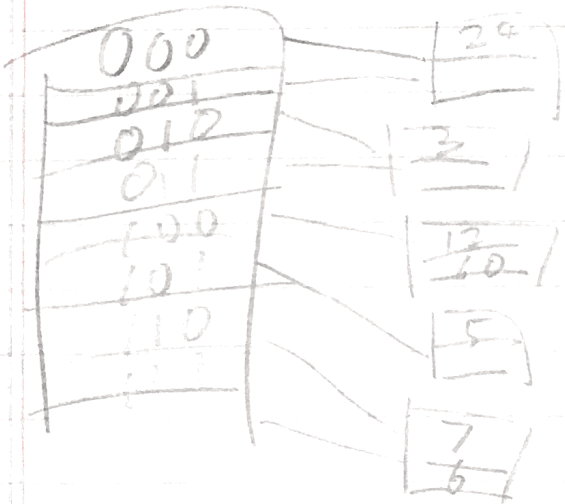
Hash index. $x \bmod 8$

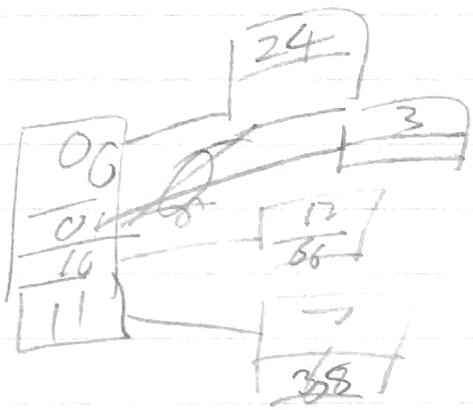
| | | |
|---|---|---|
| 12 | 4 | 100 |
| 60 | 4 | 100 |
| 7 | 7 | 111 |
| 24 | 0 | 000 |
| 38 | 6 | 110 |
| 99 | 3 | 011 |
| 53 | 5 | 101 |
| 2 | 2 | 010 |
| 25 | 1 | 001 |
| 29 | 5 | 101 |





$$\left\lfloor \frac{250}{n} \right\rfloor + 1 + n \leq 100$$

$$\frac{250}{n} + \frac{n}{n} + \frac{n^2}{n} \leq 100$$

$$250 + n + n^2 \leq 100n$$

$$n^2 + n - 100n \leq -250$$

$$n^2 - 99n \leq -250$$

$$n^2 - 99n + 250 \leq 0$$

$$n_1 = 3, \quad n_2 = 96$$

4> hash join.

taken ⋈ taught

# of passes for hashing. $= \lceil \log_{M-1} b_s \rceil - 1 = \lceil \log_{99} 197 \rceil - 1 = 1$

Cost $= 2 * (100{,}000 + 197) + (10000 + 197)$

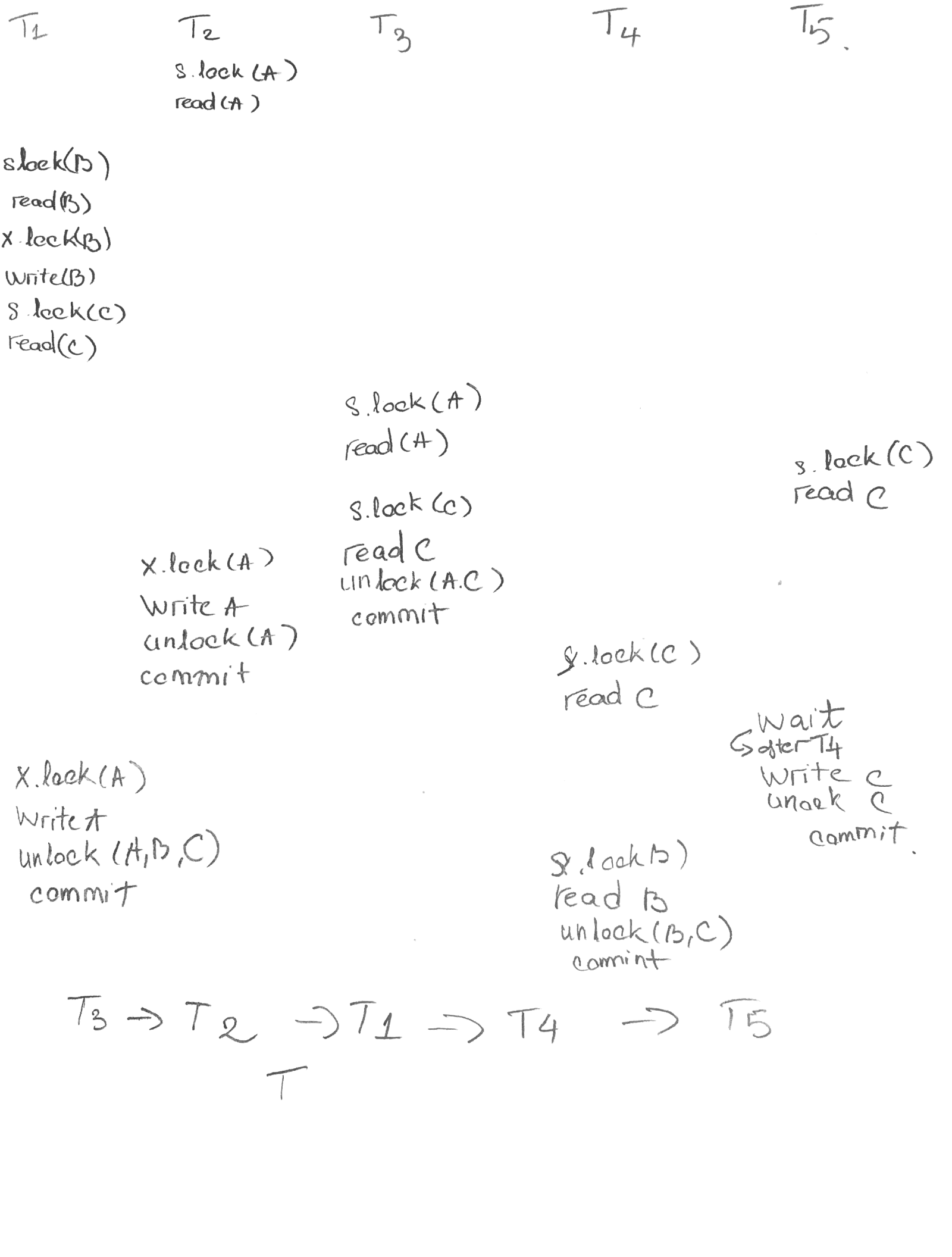
$= 300\,591$

taugh ⋈ taken

# of passes for hashing $= \lceil \log_{99} 100000 \rceil - 1 = 3 - 1 = 2$.

Cost $= 2 * 2 * (100000 + 197) + 100000 + 197$

$= 500{,}985$


T1
T2
T3
T4
T5
S.lock(A)
read(A)
slock(B)
read(B)
X.lock(B)
write(B)
S.lock(C)
read(C)
S.lock(A)
read(A)
S.lock(C)
read C
unlock(A,C)
commit
S.lock(C)
read C
X.lock(A)
Write A
unlock(A)
commit
Wait
after T4
Write C
unock C
commit
X.lock(A)
Write A
unlock(A,B,C)
commit
S.lock B)
read B
unlock(B,C)
comint
T3 → T2 → T1 → T4 → T5
T

1. Salary > 60.

- B+ tree

The size of a tuple is $20 * 5 = 100$

A page size is 4096 bytes

The number of tuples per page is $\frac{4096}{100} = 40$

The number of pointer per page is $\frac{4096 - 4}{20 + 4} + 1 = 171$

The high of $B^+$ tree is $\lceil \log_{\frac{171}{2}} 25000 \rceil = 2$.

The number of leaf pages is $1000000 / \left(\frac{171 - 1}{2}\right) * \frac{100 - 60}{100 - 51}$

$= 9604$.

The number of qualifing tuples $= 1000000 \times \frac{100 - 60}{100 - 51}$

$= 816327$

$\text{Cost} = (2 - 1) + 9604 + 816327 = 825933$

- File scan.

Size of tuple = 100

The number of fit in a page $\frac{4096}{100} = 40$

Cost = 25000

$\Rightarrow$ Cost = 25000

~~tot~~ssume if we have primary index on courses) in taken

# of pages in taken qualifies in search is

$$\left[\frac{800}{40}\right] = 20 \text{ pages}$$

$$\text{total} = 197 + 20000 * (2+20)$$

$$= 440.197$$

③ merge - join

cost of external merge join.

$$2\,br\left[\lg_{m-1}\frac{br}{M}\right] + br$$

sort taken.

$$2 * 100000 * \left[\lg_{99}\frac{100000}{100}\right] + 100000 = 500,000$$

sort taught:

$$2 * 197 * \left[\log_{99}\frac{197}{100}\right. + 197 = 591$$

$$\text{total cost} = 500000 + 591 + \underbrace{(100000 + 197)}_{(\text{final})} + \underbrace{(100000 + 197)}_{(\text{merge})}$$

$$= 700,985$$

+ assume if we have primary index on course ) in taken

cost of external merge join = $591 + 197 + 100197 = 100,1985$

taken (~~mid~~ name, course, score, semester, year)

taught (course, instructor)

taken has 4 000 000 tuples, 100,000 pages
taught has 20,000 tuples, 197 pages

$M = 100$ pages.

① block-nested loop join.

taken ⋈ taught.

$$\left[\frac{100000}{\underbrace{100-2}_{(M)}}\right] * 197 + 100.000 = 301,137$$

taught ⋈ taken.

$$\left[\frac{197}{100-2}\right] * 100000 + 197 = 300,197.$$

② indexed-nested loop join.

assume secondary index on <course> in both relations.

taken ⋈ taught

height of B+tree on course in taught.

$h = \lceil \log_{\frac{171}{2}} \frac{5000}{(5000 \text{ course in data base})} \rceil = 2$

# of tuple in taught that qualifies the equlity search is $\lceil \frac{20000}{5000} \rceil = 4$

cost to retrieve the tuples $= 2 + 4 = 6$ pages

total $= 100000 + 4.000000 * 6 = 24,100,000$ pages

taught ⋈ taken

$h = \lceil \log_{\frac{171}{2}} 5000 \rceil = 2$.

# of tuple in taken qualifies the search. $\frac{4000000}{5000} = 800$

total cost $= 197 + 20000 * (2 + 800)$

COMP. 5740 notes

1/31/2017

2, 7, 8, 11, 14, 21, 22, 27, 32, 36