

COP 6726: DATABASE SYSTEM IMPLEMENTATION

Assignment 2.2: Sorted File Implementation

Group Info:

	Name	UFID
1.	Manishkumar Chopra	1796-7121
2.	Neel Manish Rami	7712-3151

I. INTRODUCTION

In this assignment, we have implemented the Sorted File. The job of the Sorted File class within the database system is to store in a sorted order wherein the sort order is provided by the user and retrieve records from the disk. We have also written unit test cases using google test unit testing library for every function which we have implemented in DBFile Class.

II. ASSUMPTIONS

- A. gcc (or clang) must be installed together with “bison” and “flex” on the machine on which the project will be tested.
- B. Google Test Unit Testing Library should also be installed and compiled on the machine on which the project will be tested.
- C. Google Test Unit Testing Library is not installed on CISE Thunder Server so the gTest command won't run on thunder.

III. FILE STRUCTURE

- A. bin/ : Contains object(.o) files.
- B. src/: Contains .cc and .h files.
- C. table_files/: Contains .tbl files which were generated using tpch data generator.
- D. gtest/: Google Test Unit testing library.
- E. catalog: Catalog file for the schema of .tbl files
- F. MakeFile: Make File.

IV. CODE EXPLANATION

Private Data Structures used in DBFile Class:-

1. **File* mySFFile:** Sorted File Class is built on top of File Class.
2. **Page* mySFPage:** Sorted File Class is built on top of Page Class.
3. **Pipe* mySFInputPipe:** This variable is used to insert records into the Input Pipe.
4. **Pipe* mySFOutputPipe:** This variable is used to remove records from the Output Pipe.
5. **Mode myMode:** This variable is an enum which has 2 values. One is Read and other is Write
6. **SortInfo* mySFSortInfo:**
7. **BigQ* mySFBigQ:** An instance of BigQ which was implemented during the previous project.
8. **OrderMaker* mySFOrderMaker:**
9. **bool queryFlag:** This variable is used when 2nd version of GetNext is called repeatedly.
10. **bool sortOrderFlag:** This variable is used when 2nd version of GetNext is called repeatedly.

Public Functions used in DBFile Class:-

1. void Add (Record &addMe);

This function is used to add records to the file. In the case of the sorted file that has been implemented in this assignment, this function first sees whether it is read or write mode. If it is in read mode, mySFBIQ variable is re-initialized and the record is then inserted into the Input Pipe.

2. int Create (char *name, fType myType, void *startup);

This function is used to create the file. Also along with creating the file, we are also creating metadata file for each .tbl file. MetaData File description is written in the code file.

3. int Open (char *name);

This function is used to open a file that has already been created and also being closed.

4. int Close();

This function simply closes the file. But before closing the file, merge operation is performed.

5. void Load (Schema &mySchema, char *loadMe);

This function bulk loads the records from the file into the Input Record. After all the records have been inserted into Input Pipe, they are removed from the Output Pipe and then they are inserted into the page and these pages are added into the Sorted File.

6. int GetNext (Record &fetchMe);

This function simply gets the next record from the file and returns it to the user.

7. **int GetNext (Record &fetchMe, CNF &applyMe, Record &literal);**

This function accepts a selection predicate and returns the next record in the file which is accepted by the selection predicate.

8. **void MoveFirst ()**

This function forces some pointer to correspond to the first record in the file.

9. **void Merge ()**

This function merges records from input pipe with the records from the sorted file. We also first change its mode to read and shutdown the pipe. Then, we merge records from the pipe and sorted file.

V. **COMMANDS TO RUN THE PROGRAM**

To compile the given test driver, type
make test.out

To run the test driver, type
./test.out

and then follow the on-screen instructions. For scan and filter operation, write any CNF which has been given in the result section below. After writing the CNF, press ENTER and then press Ctrl+D.

The thunder server at cise.ufl.edu doesn't have Google Test installed so you might have to download it.

To compile Google Test, type
make gTest21

To run the unit tests, type
cd bin
./gTestProj21

The unit tests should run and you should be able to see the test results.

VI. RESULTS

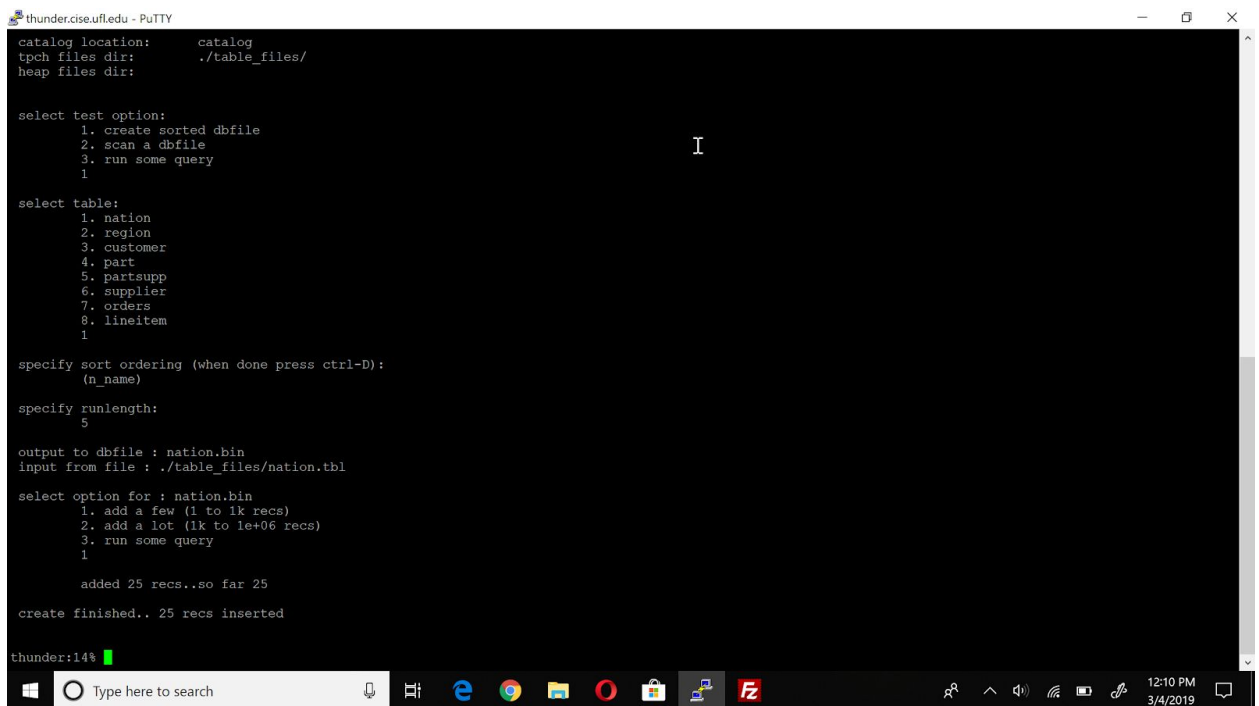
We ran our program on 1 set of data which was generated by tpch data generator. That set of data is 10M.

A. 10M Data

We verified those results by inserting this 10M data into MariaDB and writing SQL queries in MariaDB.

Query Type A : Creating Sorted File

1. nation.tbl



```
thunder.cise.ufl.edu - PuTTY
catalog location:      catalog
tpch files dir:       ./table_files/
heap files dir:

select test option:
  1. create sorted dbfile
  2. scan a dbfile
  3. run some query
  1

select table:
  1. nation
  2. region
  3. customer
  4. part
  5. partsupp
  6. supplier
  7. orders
  8. lineitem
  1

specify sort ordering (when done press ctrl-D):
  (n_name)

specify runlength:
  5

output to dbfile : nation.bin
input from file : ./table_files/nation.tbl

select option for : nation.bin
  1. add a few (1 to 1k recs)
  2. add a lot (1k to 1e+06 recs)
  3. run some query
  1

  added 25 recs..so far 25

create finished.. 25 recs inserted

thunder:14%
```

2. region.tbl

```
thunder.cise.ufl.edu - PuTTY
catalog location:      catalog
tpch files dir:        ./table_files/
heap files dir:

select test option:
  1. create sorted dbfile
  2. scan a dbfile
  3. run some query
  1

select table:
  1. nation
  2. region
  3. customer
  4. part
  5. partsupp
  6. supplier
  7. orders
  8. lineitem
  2

specify sort ordering (when done press ctrl-D):
  (r_name)

specify runlength:
  100

output to dbfile : region.bin
input from file : ./table_files/region.tbl

select option for : region.bin
  1. add a few (1 to 1k recs)
  2. add a lot (1k to 1e+06 recs)
  3. run some query
  1

  added 5 recs..so far 5

create finished.. 5 recs inserted

thunder:16% █
```

3. orders.tbl

```
thunder.cise.ufl.edu - PuTTY
catalog location:      catalog
tpch files dir:        ./table_files/
heap files dir:

select test option:
  1. create sorted dbfile
  2. scan a dbfile
  3. run some query
  1

select table:
  1. nation
  2. region
  3. customer
  4. part
  5. partsupp
  6. supplier
  7. orders
  8. lineitem
  7

specify sort ordering (when done press ctrl-D):
  (o_orderkey) AND (o_custkey)

specify runlength:
  50

output to dbfile : orders.bin
input from file : ./table_files/orders.tbl

select option for : orders.bin
  1. add a few (1 to 1k recs)
  2. add a lot (1k to 1e+06 recs)
  3. run some query
  2

  added 15000 recs..so far 15000

create finished.. 15000 recs inserted

thunder:19% █
```

Query Type B (Scanning a Sorted File)

1. nation.tbl

```
thunder.cise.ufl.edu - PuTTY

8. lineitem
1
scan : nation.bin
      n_nationkey: [0], n_name: [ALGERIA], n_regionkey: [0], n_comment: [ haggle. carefully final deposits detect slyly again]
.n_nationkey: [1], n_name: [ARGENTINA], n_regionkey: [1], n_comment: [al foxes promise slyly according to the regular accounts. bold requests along]
.n_nationkey: [2], n_name: [BRAZIL], n_regionkey: [1], n_comment: [y alongside of the pending deposits. carefully special packages are about the ironic forge
s. slyly special ]
.n_nationkey: [3], n_name: [CANADA], n_regionkey: [1], n_comment: [eas hang ironic, silent packages. slyly regular packages are furiously over the tithes. fl
uffily bold]
.n_nationkey: [18], n_name: [CHINA], n_regionkey: [2], n_comment: [c dependencies. furiously express notornis sleep slyly regular accounts. ideas sleep. depo
s]
.n_nationkey: [4], n_name: [EGYPT], n_regionkey: [4], n_comment: [y above the carefully unusual theodolites. final dugouts are quickly across the furiously r
egular d]
.n_nationkey: [5], n_name: [ETHIOPIA], n_regionkey: [0], n_comment: [ven packages wake quickly. regul]
.n_nationkey: [6], n_name: [FRANCE], n_regionkey: [3], n_comment: [refully final requests. regular, ironi]
.n_nationkey: [7], n_name: [GERMANY], n_regionkey: [3], n_comment: [l platelets. regular accounts x-ray: unusual, regular acco]
.n_nationkey: [8], n_name: [INDIA], n_regionkey: [2], n_comment: [as excuses cajole slyly across the packages. deposits print aroun]
.n_nationkey: [9], n_name: [INDONESIA], n_regionkey: [2], n_comment: [ slyly express asymptotes. regular deposits haggle slyly. carefully ironic hockey playe
rs sleep blithely. carefully]
.n_nationkey: [10], n_name: [IRAN], n_regionkey: [4], n_comment: [efully alongside of the slyly final dependencies. ]
.n_nationkey: [11], n_name: [IRAQ], n_regionkey: [4], n_comment: [nic deposits boost atop the quickly final requests? quickly regula]
.n_nationkey: [12], n_name: [JAPAN], n_regionkey: [2], n_comment: [ously. final, express gifts cajole a]
.n_nationkey: [13], n_name: [JORDAN], n_regionkey: [4], n_comment: [ic deposits are blithely about the carefully regular pa]
.n_nationkey: [14], n_name: [KENYA], n_regionkey: [0], n_comment: [ pending excuses haggle furiously deposits. pending, express pinto beans wake fluffily pas
t t]
.n_nationkey: [15], n_name: [MOROCCO], n_regionkey: [0], n_comment: [rns. blithely bold courts among the closely regular packages use furiously bold platelet
s?]
.n_nationkey: [16], n_name: [MOZAMBIQUE], n_regionkey: [0], n_comment: [s. ironic, unusual asymptotes wake blithely r]
.n_nationkey: [17], n_name: [PERU], n_regionkey: [1], n_comment: [platelets. blithely pending dependencies use fluffily across the even pinto beans. carefull
y silent account]
.n_nationkey: [19], n_name: [ROMANIA], n_regionkey: [3], n_comment: [ular asymptotes are about the furious multipliers. express dependencies nag above the ir
onically ironic account]
.n_nationkey: [22], n_name: [RUSSIA], n_regionkey: [3], n_comment: [ requests against the platelets use never according to the quickly regular pint]
.n_nationkey: [20], n_name: [SAUDI ARABIA], n_regionkey: [4], n_comment: [ts. silent requests haggle. closely express packages sleep across the blithely]
.n_nationkey: [23], n_name: [UNITED KINGDOM], n_regionkey: [3], n_comment: [eans boost carefully special requests. accounts are. carefully]
.n_nationkey: [24], n_name: [UNITED STATES], n_regionkey: [1], n_comment: [y final packages. slow foxes cajole quickly. quickly silent platelets breach ironi
c accounts. unusual pinto be]
.n_nationkey: [21], n_name: [VIETNAM], n_regionkey: [2], n_comment: [hely enticingly express accounts. even, final ]
.
scanned 25 recs

thunder:20%
```

2. orders.tbl

```
thunder.cise.ufl.edu - PuTTY

.o_orderkey: [59910], o_custkey: [763], o_orderstatus: [0], o_totalprice: [33820.9], o_orderdate: [1995-06-11], o_orderpriority: [3-MEDIUM], o_clerk: [Clerk#
000000183], o_shippriority: [0], o_comment: [into beans. furiously unusual packages according to th]
.o_orderkey: [59911], o_custkey: [140], o_orderstatus: [0], o_totalprice: [57960.1], o_orderdate: [1995-12-19], o_orderpriority: [4-NOT SPECIFIED], o_clerk:
[Clerk#000000662], o_shippriority: [0], o_comment: [c packages. slyly pending asymptotes are about the special, unusual dolph]
.o_orderkey: [59936], o_custkey: [568], o_orderstatus: [F], o_totalprice: [81094.4], o_orderdate: [1992-11-21], o_orderpriority: [1-URGENT], o_clerk: [Clerk#
000000271], o_shippriority: [0], o_comment: [structions haggle fluffily ironic, regular requests. furiously regular ]
.o_orderkey: [59937], o_custkey: [985], o_orderstatus: [F], o_totalprice: [6524.6], o_orderdate: [1994-12-29], o_orderpriority: [2-HIGH], o_clerk: [Clerk#000
000356], o_shippriority: [0], o_comment: [wake outside the ironic]
.o_orderkey: [59938], o_custkey: [1079], o_orderstatus: [0], o_totalprice: [76407.3], o_orderdate: [1995-08-07], o_orderpriority: [2-HIGH], o_clerk: [Clerk#0
00000356], o_shippriority: [0], o_comment: [fter the special accounts use blithely slyly final ideas? ful]
.o_orderkey: [59939], o_custkey: [425], o_orderstatus: [F], o_totalprice: [119287], o_orderdate: [1993-09-02], o_orderpriority: [3-MEDIUM], o_clerk: [Clerk#0
00000287], o_shippriority: [0], o_comment: [uriously above the fluff]
.o_orderkey: [59940], o_custkey: [238], o_orderstatus: [F], o_totalprice: [130910], o_orderdate: [1994-09-25], o_orderpriority: [5-LOW], o_clerk: [Clerk#0000
00515], o_shippriority: [0], o_comment: [avelly pending deposits haggle quickly among the carefully ]
.o_orderkey: [59941], o_custkey: [1414], o_orderstatus: [F], o_totalprice: [98772.7], o_orderdate: [1992-10-22], o_orderpriority: [1-URGENT], o_clerk: [Clerk
#000000005], o_shippriority: [0], o_comment: [ests. quickly pending courts wake blithely around the final excuses. s]
.o_orderkey: [59942], o_custkey: [581], o_orderstatus: [F], o_totalprice: [243022], o_orderdate: [1994-02-09], o_orderpriority: [3-MEDIUM], o_clerk: [Clerk#0
00000435], o_shippriority: [0], o_comment: [nding accounts across the slyly special requests cajole accordi]
.o_orderkey: [59943], o_custkey: [340], o_orderstatus: [F], o_totalprice: [57983.4], o_orderdate: [1993-06-10], o_orderpriority: [5-URGENT], o_clerk: [Clerk#
000000504], o_shippriority: [0], o_comment: [al packages nag carefully. regular ideas will are blithely special instruct]
.o_orderkey: [59968], o_custkey: [898], o_orderstatus: [0], o_totalprice: [59677.3], o_orderdate: [1997-10-12], o_orderpriority: [4-NOT SPECIFIED], o_clerk:
[Clerk#000000833], o_shippriority: [0], o_comment: [ages. furiously final foxes wake of the]
.o_orderkey: [59969], o_custkey: [1210], o_orderstatus: [F], o_totalprice: [223578], o_orderdate: [1992-01-12], o_orderpriority: [2-HIGH], o_clerk: [Clerk#00
0000926], o_shippriority: [0], o_comment: [gular packages use. final deposits cajole quickly regul]
.o_orderkey: [59970], o_custkey: [970], o_orderstatus: [0], o_totalprice: [25973.3], o_orderdate: [1998-07-15], o_orderpriority: [1-URGENT], o_clerk: [Clerk#
000000181], o_shippriority: [0], o_comment: [ pearls nag. fluffily special foxes boost s]
.o_orderkey: [59971], o_custkey: [826], o_orderstatus: [F], o_totalprice: [242729], o_orderdate: [1995-06-01], o_orderpriority: [1-URGENT], o_clerk: [Clerk#0
00000461], o_shippriority: [0], o_comment: [odolites. slyly final instructions wake slyly. special foxes al]
.o_orderkey: [59972], o_custkey: [1480], o_orderstatus: [F], o_totalprice: [98245.7], o_orderdate: [1994-11-01], o_orderpriority: [4-NOT SPECIFIED], o_clerk:
[Clerk#000000260], o_shippriority: [0], o_comment: [le along the deposits. blithely bol]
.o_orderkey: [59973], o_custkey: [229], o_orderstatus: [0], o_totalprice: [230718], o_orderdate: [1995-11-16], o_orderpriority: [5-LOW], o_clerk: [Clerk#0000
00891], o_shippriority: [0], o_comment: [lyly among the furiously fluffy theodolites. carefully f]
.o_orderkey: [59974], o_custkey: [761], o_orderstatus: [0], o_totalprice: [63273.4], o_orderdate: [1995-12-05], o_orderpriority: [2-HIGH], o_clerk: [Clerk#00
0000862], o_shippriority: [0], o_comment: [counts. even, ironic packages cajole ironic]
.o_orderkey: [59975], o_custkey: [706], o_orderstatus: [F], o_totalprice: [59995.3], o_orderdate: [1993-12-22], o_orderpriority: [5-LOW], o_clerk: [Clerk#000
000193], o_shippriority: [0], o_comment: [n. even packages affix fluffily against ]
.o_orderkey: [60000], o_custkey: [1426], o_orderstatus: [P], o_totalprice: [299402], o_orderdate: [1995-04-21], o_orderpriority: [2-HIGH], o_clerk: [Clerk#00
0000194], o_shippriority: [0], o_comment: [usual frets use alongside of the furiou]
.
scanned 15000 recs

thunder:21%
```


3. Customer.tbl

```
thunder.cise.ufl.edu - PuTTY
.c_custkey: [657], c_name: [Customer#000000657], c_address: [BpXQ3sbx8bcU0], c_nationkey: [19], c_phone: [29-952-164-8914], c_acctbal: [8729.97], c_mktsegment: [FURNITURE], c_comment: [ies boost slyly bravely express instructions. fluffily even theodolites integrate s]
.c_custkey: [658], c_name: [Customer#000000658], c_address: [98boxGtXimmq49lyT32t], c_nationkey: [11], c_phone: [11-675-750-9832], c_acctbal: [4716.68], c_mktsegment: [HOUSEHOLD], c_comment: [r ideas about the slyly ironic theodolites integrate according to ]
.c_custkey: [659], c_name: [Customer#000000659], c_address: [ThR9miOadPuvVEZyz 3MMjHPwB], c_nationkey: [0], c_phone: [10-834-287-1466], c_acctbal: [5297.68], c_mktsegment: [HOUSEHOLD], c_comment: [s cajole final, regular dependencies. final accountS sleep! furiously regular requests wake slyly silent]
.c_custkey: [660], c_name: [Customer#000000660], c_address: [2D4fphYxb5pyE], c_nationkey: [0], c_phone: [10-987-901-3986], c_acctbal: [2110.3], c_mktsegment: [MACHINERY], c_comment: [ding excuses haggle furiously regular foxes. finally]
.c_custkey: [661], c_name: [Customer#000000661], c_address: [IMqnuuRvMSy2N1Tikakwke], c_nationkey: [4], c_phone: [14-983-203-6472], c_acctbal: [1735.44], c_mktsegment: [HOUSEHOLD], c_comment: [ regular theodolites. brave platelets]
.c_custkey: [662], c_name: [Customer#000000662], c_address: [ss AgOrB5Vfublk bsmTgbw2ddJD], c_nationkey: [0], c_phone: [10-728-355-4532], c_acctbal: [4517.33], c_mktsegment: [BUILDING], c_comment: [ckages haggle! quickly regular ideas are after the furil]
.c_custkey: [663], c_name: [Customer#000000663], c_address: [fgQwXhWwC40UogVvb4idYbBElDxc6], c_nationkey: [9], c_phone: [19-613-882-5677], c_acctbal: [9698.21], c_mktsegment: [AUTOMOBILE], c_comment: [r the slyly final packages. slyly bold attainments detect blithely acco]
.c_custkey: [664], c_name: [Customer#000000664], c_address: [viRe1P6Hlyl4LXpU7HPw], c_nationkey: [15], c_phone: [25-329-655-5068], c_acctbal: [8878.22], c_mktsegment: [BUILDING], c_comment: [yly ironic requests cajole pending pla]
.c_custkey: [665], c_name: [Customer#000000665], c_address: [F09GgsDOP28D3zR], c_nationkey: [22], c_phone: [32-759-858-2984], c_acctbal: [-616.79], c_mktsegment: [BUILDING], c_comment: [y along the special requests. blithely regular waters thrash abou]
.c_custkey: [666], c_name: [Customer#000000666], c_address: [dD32Q8Kl6KW], c_nationkey: [2], c_phone: [12-594-508-9621], c_acctbal: [4538.54], c_mktsegment: [AUTOMOBILE], c_comment: [ special packages boost across the even accounts. ironic accounts serv]
.c_custkey: [667], c_name: [Customer#000000667], c_address: [cQgeEC,OD9XC1JXyosHqcpv0fPuDp9ek5KKb70tQ], c_nationkey: [6], c_phone: [16-917-453-2490], c_acctbal: [3288.76], c_mktsegment: [AUTOMOBILE], c_comment: [ilthely about the furiously eil]
.c_custkey: [668], c_name: [Customer#000000668], c_address: [PCmw0r6KkljXZsljablJ], c_nationkey: [15], c_phone: [25-582-501-2346], c_acctbal: [8184.21], c_mktsegment: [FURNITURE], c_comment: [uffy excuses are carefully regular, ironic pinto]
.c_custkey: [669], c_name: [Customer#000000669], c_address: [axd031aVyYX5XnqnwC0p2Dx6Mn3LDDMp], c_nationkey: [10], c_phone: [20-471-280-4789], c_acctbal: [6019.2], c_mktsegment: [MACHINERY], c_comment: [ronic decoys. blithely ironic account]
.c_custkey: [670], c_name: [Customer#000000670], c_address: [Rjtelv6tjpxl], c_nationkey: [2], c_phone: [12-839-426-4266], c_acctbal: [6738.93], c_mktsegment: [BUILDING], c_comment: [y unusual deposits are carefully regular foxes. packages dazzle carefully. furiously unusual d]
.c_custkey: [671], c_name: [Customer#000000671], c_address: [ic6Grt0giB,HDEiBK,,FYGHXQpc], c_nationkey: [21], c_phone: [31-593-213-9388], c_acctbal: [3227.87], c_mktsegment: [FURNITURE], c_comment: [bold ideas above the ironic packages affix blithely about the furilou]
.c_custkey: [672], c_name: [Customer#000000672], c_address: [Rsg8rIlbgRB8VlgldElU56j,08N ], c_nationkey: [18], c_phone: [28-774-971-2700], c_acctbal: [7778.95], c_mktsegment: [BUILDING], c_comment: [ake. regular requests about the idle asymptotes haggle slyly final, silent packages. carefully special]
.c_custkey: [673], c_name: [Customer#000000673], c_address: [Q2S9D0w6mQ5iQ0A8DxD6UXNMPZky], c_nationkey: [4], c_phone: [14-769-230-8609], c_acctbal: [3942.58], c_mktsegment: [MACHINERY], c_comment: [ons will cajole blithely. always even packages dazzle blithely across the regular, unusual ]
.c_custkey: [674], c_name: [Customer#000000674], c_address: [GLZCUQrtiNtPKdK 0086ZF], c_nationkey: [5], c_phone: [15-543-819-4391], c_acctbal: [7889.64], c_mktsegment: [BUILDING], c_comment: [lites cajole ironic accounts. regular, ironic gifts nag furiously against the blithely express deposits; unusual, ]
.c_custkey: [675], c_name: [Customer#000000675], c_address: [caneW8Kozr8RDTmenqJon], c_nationkey: [20], c_phone: [30-299-640-9565], c_acctbal: [5295.26], c_mktsegment: [HOUSEHOLD], c_comment: [riously even requests boost slowly. ex]
scanned 249 recs

thunder:25%
```

Query Type C (Extracting Records based on user provided CNF)

Query 1 (r_name = 'EUROPE')

```
thunder:17% ./test.out

** IMPORTANT: MAKE SURE THE INFORMATION BELOW IS CORRECT **
catalog location:      catalog
tpch files dir:        ./table_files/
heap files dir:

select test option:
  1. create sorted dbfile
  2. scan a dbfile
  3. run some query
  3

select table:
  1. nation
  2. region
  3. customer
  4. part
  5. partsupp
  6. supplier
  7. orders
  8. lineitem
  2

enter CNF predicate (when done press ctrl-D):
(r_name = 'EUROPE')
r_regionkey: [3], r_name: [EUROPE], r_comment: [ly final courts cajole furiously final excuse]

query over region.bin returned 1 recs

thunder:18%
```


Query 2 (r_name = 'MIDDLE EAST') AND (r_regionkey > 1)

```
thunder:4% ./test.out

** IMPORTANT: MAKE SURE THE INFORMATION BELOW IS CORRECT **
catalog location:    catalog
tpch files dir:      ./table_files/
heap files dir:

select test option:
  1. create sorted dbfile
  2. scan a dbfile
  3. run some query
  3

select table:
  1. nation
  2. region
  3. customer
  4. part
  5. partsupp
  6. supplier
  7. orders
  8. lineitem
  2

enter CNF predicate (when done press ctrl-D):
(r_name = 'MIDDLE EAST') AND (r_regionkey > 1)
r_regionkey: [4], r_name: [MIDDLE EAST], r_comment: [uickly special accounts cajole carefully blithely close requests. carefully final asymptotes haggle furiousl]

query over region.bin returned 1 recs
```

Query 3 (n_regionkey = 3) AND (n_nationkey > 10) AND (n_name > 'JAPAN')

```
thunder:7% ./test.out

** IMPORTANT: MAKE SURE THE INFORMATION BELOW IS CORRECT **
catalog location:    catalog
tpch files dir:      ./table_files/
heap files dir:

select test option:
  1. create sorted dbfile
  2. scan a dbfile
  3. run some query
  3

select table:
  1. nation
  2. region
  3. customer
  4. part
  5. partsupp
  6. supplier
  7. orders
  8. lineitem
  1

enter CNF predicate (when done press ctrl-D):
(n_regionkey = 3) AND (n_nationkey > 10) AND (n_name > 'JAPAN')
n_nationkey: [19], n_name: [ROMANIA], n_regionkey: [3], n_comment: [ular asymptotes are about the furious multipliers. express dependencies nag above the ironically ironic account]
n_nationkey: [22], n_name: [RUSSIA], n_regionkey: [3], n_comment: [ requests against the platelets use never according to the quickly regular pint]
n_nationkey: [23], n_name: [UNITED KINGDOM], n_regionkey: [3], n_comment: [eans boost carefully special requests. accounts are. carefull]

query over nation.bin returned 3 recs
```

Query 4 (c_nationkey = 23) AND (c_mktsegment = 'FURNITURE') AND (c_acctbal > 1000.00) AND (c_acctbal < 8000.00)

```
thunder:11% ./test.out

** IMPORTANT: MAKE SURE THE INFORMATION BELOW IS CORRECT **
catalog location:      catalog
tpch files dir:        ./table_files/
heap files dir:

select test option:
  1. create sorted dbfile
  2. scan a dbfile
  3. run some query
  3

select table:
  1. nation
  2. region
  3. customer
  4. part
  5. partsupp
  6. supplier
  7. orders
  8. linetitem
  3

enter CNF predicate (when done press ctrl-D):
(c_nationkey = 23) AND (c_mktsegment = 'FURNITURE') AND (c_acctbal > 1000.00) AND (c_acctbal < 8000.00)
c_custkey: [87], c_name: [Customer#000000087], c_address: [hgGHHVSWQl 6jZ6Ev], c_nationkey: [23], c_phone: [33-869-884-7053], c_acctbal: [6327.54], c_mktsegment: [FURNITURE], c_c
omment: [hely ironic requests integrate according to the ironic accounts. slyly regular pla]
c_custkey: [174], c_name: [Customer#000000174], c_address: [R5 fCPMSedXtUpp5Ax], c_nationkey: [23], c_phone: [33-845-455-8799], c_acctbal: [1944.73], c_mktsegment: [FURNITURE], c_comment
: [oldly even requests haggle quickly blithely ironic accounts. idly final foxes doze slyly pending dep]
c_custkey: [338], c_name: [Customer#000000338], c_address: [ aiVAeWgI0okGSJv7OgvKqMvPLhxF3bLT8josX], c_nationkey: [23], c_phone: [33-302-620-7535], c_acctbal: [4092.49], c_mktsegment: [F
URNITURE], c_comment: [ckages nag blithely regular requests: carefully final packages between the slyly regular instructions sleep ]
c_custkey: [415], c_name: [Customer#000000415], c_address: [334jCRlUb,gx3], c_nationkey: [23], c_phone: [33-346-876-2972], c_acctbal: [2317.93], c_mktsegment: [FURNITURE], c_comment: [eg
ular deposits. blithely ironic inst]
c_custkey: [794], c_name: [Customer#000000794], c_address: [RMV8 LyGnJ67Nc5cxPYlDSF], c_nationkey: [23], c_phone: [33-633-470-5945], c_acctbal: [1709.5], c_mktsegment: [FURNITURE], c_c
omment: [gular patterns cajole slyly blithely final ideas? furiously unusual courts wake among ]
c_custkey: [982], c_name: [Customer#000000982], c_address: [EN9aD5XghZq], c_nationkey: [23], c_phone: [33-460-986-9418], c_acctbal: [1437.55], c_mktsegment: [FURNITURE], c_comment: [lith
sly express requests along the carefully pendit]
c_custkey: [1117], c_name: [Customer#000001117], c_address: [80NFzBRWj5tUuaRdnsFE7Eq], c_nationkey: [23], c_phone: [33-461-439-5684], c_acctbal: [2829.07], c_mktsegment: [FURNITURE], c_c
omment: [ ironic deposits need to haggle furiously. furiously bold deposits use among the carefully ironic]
c_custkey: [1227], c_name: [Customer#000001227], c_address: [GiTSIr0JzJTZerbFtiJy6Gj], c_nationkey: [23], c_phone: [33-468-642-3107], c_acctbal: [3335.72], c_mktsegment: [FURNITURE], c_c
omment: [fly atop the bold, unusual theo]
c_custkey: [1391], c_name: [Customer#000001391], c_address: [7MqNSYfIjW6Yua7LVU6l7QMjjiyJ2KTZEaQ], c_nationkey: [23], c_phone: [33-558-545-3053], c_acctbal: [5510.28], c_mktsegment: [FUR
NITURE], c_comment: [ges haggle slyly across the carefully pending accounts. slyly regular accounts should sleep. slyly express packages]

query over customer.bin returned 9 recs

thunder:12% █
```

Query 5 (p_brand = 'Brand#13') AND (p_retailprice > 500.00) AND (p_retailprice < 930.00) AND (p_size > 28) AND (p_size < 1000000)

```
thunder:15% ./test.out

** IMPORTANT: MAKE SURE THE INFORMATION BELOW IS CORRECT **
catalog location:      catalog
tpch files dir:        ./table_files/
heap files dir:

select test option:
  1. create sorted dbfile
  2. scan a dbfile
  3. run some query
  3

select table:
  1. nation
  2. region
  3. customer
  4. part
  5. partsupp
  6. supplier
  7. orders
  8. linetitem
  4

enter CNF predicate (when done press ctrl-D):
(p_brand = 'Brand#13') AND (p_retailprice > 500.00) AND (p_retailprice < 930.00) AND (p_size > 28) AND (p_size < 1000000)
p_partkey: [1022], p_name: [olive smoke blue dim ghost], p_mfgr: [Manufacturer#1], p_brand: [Brand#13], p_type: [SMALL BURNISHED COPPER], p_size: [33], p_container: [WRAP CAN], p
_retailprice: [923.02], p_comment: [sly quickly ]

query over part.bin returned 1 recs

thunder:16% █
```

Query 6 (ps_supplycost > 999.00)

```
thunder:18% ./test.out

** IMPORTANT: MAKE SURE THE INFORMATION BELOW IS CORRECT **
catalog location:    catalog
tpch files dir:      ./table_files/
heap files dir:

select test option:
  1. create sorted dbfile
  2. scan a dbfile
  3. run some query
  3

select table:
  1. nation
  2. region
  3. customer
  4. part
  5. partsupp
  6. supplier
  7. orders
  8. linetitem
  5

enter CNF predicate (when done press ctrl-D):
  (ps_supplycost > 999.00)
  ps_partkey: [1667], ps_suppkey: [91], ps_availqty: [5383], ps_supplycost: [999.36], ps_comment: [instructions. slyly even accounts across the bold ideas hag]
ps_partkey: [857], ps_suppkey: [57], ps_availqty: [9270], ps_supplycost: [999.64], ps_comment: [furiously pending pinto beans. special, bold instructions wake regularly. blith]
ps_partkey: [914], ps_suppkey: [83], ps_availqty: [4678], ps_supplycost: [999.65], ps_comment: [lyly alongside of the furiously quiet instructions. slyly final account]
ps_partkey: [768], ps_suppkey: [1], ps_availqty: [2578], ps_supplycost: [999.77], ps_comment: [ep carefully between the quickly special deposits. quickly regular platelets use slyly thin
ly ironic excuses. quickly regular ideas poach. ideas haggle across the car]
ps_partkey: [238], ps_suppkey: [66], ps_availqty: [1615], ps_supplycost: [999.92], ps_comment: [riously ironic foxes detect fluffily across the regular packages]
ps_partkey: [1793], ps_suppkey: [36], ps_availqty: [5136], ps_supplycost: [999.92], ps_comment: [lets grow carefully. slyly silent ideas about the foxes nag blithely ironi]
ps_partkey: [160], ps_suppkey: [87], ps_availqty: [8324], ps_supplycost: [999.93], ps_comment: [ly final instructions. closely final deposits nag furiously alongside of the furiously dog
ged theodolites. blithely unusual theodolites are furti]
ps_partkey: [1218], ps_suppkey: [19], ps_availqty: [6915], ps_supplycost: [999.95], ps_comment: [fluffily unusual packages doubt even, regular requests. ironic requests detect carefully
blithely silen]
ps_partkey: [1628], ps_suppkey: [70], ps_availqty: [1761], ps_supplycost: [999.95], ps_comment: [lyly about the permanently ironic instructions. carefully ironic pinto beans]
ps_partkey: [1385], ps_suppkey: [24], ps_availqty: [2120], ps_supplycost: [999.97], ps_comment: [ts haggle blithely about the pending, regular ideas! e]
ps_partkey: [1213], ps_suppkey: [51], ps_availqty: [5070], ps_supplycost: [999.99], ps_comment: [ ironic, special deposits. carefully final deposits haggle fluffily. furiously final foxe
s use furiously furiously ironic accounts. package]

query over partsupp.bin returned 11 recs
```

Query 7 (ps_availqty < 10) AND (ps_supplycost > 100.00) AND (ps_suppkey < 300)

```
thunder:19% ./test.out

** IMPORTANT: MAKE SURE THE INFORMATION BELOW IS CORRECT **
catalog location:    catalog
tpch files dir:      ./table_files/
heap files dir:

select test option:
  1. create sorted dbfile
  2. scan a dbfile
  3. run some query
  3

select table:
  1. nation
  2. region
  3. customer
  4. part
  5. partsupp
  6. supplier
  7. orders
  8. linetitem
  5

enter CNF predicate (when done press ctrl-D):
  (ps_availqty < 10) AND (ps_supplycost > 100.00) AND (ps_suppkey < 300)
  ps_partkey: [977], ps_suppkey: [78], ps_availqty: [8], ps_supplycost: [102.28], ps_comment: [ regular excuses. quickly ironic courts are bustly. theodolites haggle carefully slyl
y final accounts. regular, special asymptotes haggle along the furiously]
ps_partkey: [744], ps_suppkey: [45], ps_availqty: [4], ps_supplycost: [698.75], ps_comment: [express packages try to use above the even excuses. furiously regular deposits above the sile
h]
ps_partkey: [1427], ps_suppkey: [28], ps_availqty: [3], ps_supplycost: [746.8], ps_comment: [lyly unusual deposits. regular deposits cajole slyly about the blithely special warthogs. fur
iously regular dolphins integrate across the bold requests. quickly regular ]
ps_partkey: [1452], ps_suppkey: [31], ps_availqty: [6], ps_supplycost: [969.62], ps_comment: [gle blithely furiously final deposits. carefully ironic packages wake. final asymptotes ar]

query over partsupp.bin returned 4 recs

thunder:20% █
```


Query 8

(l_orderkey > 100) AND (l_orderkey < 1000) AND (l_partkey > 100) AND (l_partkey < 5000) AND (l_shipmode = 'AIR') AND (l_linestatus = 'F') AND (l_tax < 0.07)

```
thunder:25% ./test.out

** IMPORTANT: MAKE SURE THE INFORMATION BELOW IS CORRECT **
catalog location:      catalog
tpch files dir:        ./table_files/
heap files dir:

select test option:
1. create sorted dbfile
2. scan a dbfile
3. run some query
3

select table:
1. nation
2. region
3. customer
4. part
5. partsupp
6. supplier
7. orders
8. linetitem

enter CNF predicate (when done press ctrl-D):
(l_orderkey > 100) AND (l_orderkey < 1000) AND (l_partkey > 100) AND (l_partkey < 5000) AND (l_shipmode = 'AIR') AND (l_linestatus = 'F') AND (l_tax < 0.07)
l_orderkey: [801], l_partkey: [547], l_suppkey: [16], l_linestatus: [2], l_quantity: [21], l_extendedprice: [38806.7], l_discount: [0.05], l_tax: [0.02], l_returnflag: [A], l_linestatus: [F], l_shipdate: [1992-03-14], l_commitdate: [1992-04-01], l_receiptdate: [1992-04-05], l_shipinstruct: [COLLECT COO], l_shipmode: [AIR], l_comment: [wake silently furiously idl e deposits.]
l_orderkey: [322], l_partkey: [1833], l_suppkey: [77], l_linestatus: [4], l_quantity: [10], l_extendedprice: [17348.3], l_discount: [0.06], l_tax: [0.03], l_returnflag: [R], l_linestatus: [F], l_shipdate: [1992-04-12], l_commitdate: [1992-05-13], l_receiptdate: [1992-04-14], l_shipinstruct: [DELIVER IN PERSON], l_shipmode: [AIR], l_comment: [ deposits affix slyly accordi ng to th]
l_orderkey: [322], l_partkey: [334], l_suppkey: [91], l_linestatus: [6], l_quantity: [3], l_extendedprice: [3702.99], l_discount: [0.08], l_tax: [0.05], l_returnflag: [A], l_linestatus: [F], l_shipdate: [1992-07-03], l_commitdate: [1992-05-10], l_receiptdate: [1992-07-28], l_shipinstruct: [NONE], l_shipmode: [AIR], l_comment: [ayers wake carefully alon the blith]
l_orderkey: [549], l_partkey: [653], l_suppkey: [54], l_linestatus: [3], l_quantity: [36], l_extendedprice: [55931.4], l_discount: [0.00], l_tax: [0.04], l_returnflag: [R], l_linestatus: [F], l_shipdate: [1992-09-11], l_commitdate: [1992-10-11], l_receiptdate: [1992-09-12], l_shipinstruct: [DELIVER IN PERSON], l_shipmode: [AIR], l_comment: [ts against the ironic, even t heodolites eng]
l_orderkey: [933], l_partkey: [992], l_suppkey: [27], l_linestatus: [3], l_quantity: [26], l_extendedprice: [49217.7], l_discount: [0.05], l_tax: [0], l_returnflag: [A], l_linestatus: [F], l_shipdate: [1992-11-09], l_commitdate: [1992-11-03], l_receiptdate: [1992-11-16], l_shipinstruct: [DELIVER IN PERSON], l_shipmode: [AIR], l_comment: [ the deposits affix slyly after ]
l_orderkey: [164], l_partkey: [1256], l_suppkey: [68], l_linestatus: [3], l_quantity: [38], l_extendedprice: [43975.5], l_discount: [0.03], l_tax: [0.06], l_returnflag: [R], l_linestatus: [F], l_shipdate: [1992-12-04], l_commitdate: [1992-11-23], l_receiptdate: [1993-01-02], l_shipinstruct: [TAKE BACK RETURN], l_shipmode: [AIR], l_comment: [counts cajole fluffily regula r packages. b]
l_orderkey: [164], l_partkey: [185], l_suppkey: [38], l_linestatus: [2], l_quantity: [24], l_extendedprice: [26044.3], l_discount: [0.05], l_tax: [0.05], l_returnflag: [R], l_linestatus: [F], l_shipdate: [1992-12-22], l_commitdate: [1992-11-27], l_receiptdate: [1993-01-06], l_shipinstruct: [NONE], l_shipmode: [AIR], l_comment: [side of the slyly unusual theodolites. f]
l_orderkey: [164], l_partkey: [1089], l_suppkey: [90], l_linestatus: [6], l_quantity: [27], l_extendedprice: [26732.2], l_discount: [0.1], l_tax: [0.04], l_returnflag: [R], l_linestatus: [F], l_shipdate: [1992-12-23], l_commitdate: [1993-01-16], l_receiptdate: [1993-01-10], l_shipinstruct: [DELIVER IN PERSON], l_shipmode: [AIR], l_comment: [ayers wake carefully a]
l_orderkey: [481], l_partkey: [287], l_suppkey: [6], l_linestatus: [2], l_quantity: [19], l_extendedprice: [21836.8], l_discount: [0.08], l_tax: [0.01], l_returnflag: [R], l_linestatus: [F], l_shipdate: [1993-01-09], l_commitdate: [1992-11-27], l_receiptdate: [1993-01-14], l_shipinstruct: [TAKE BACK RETURN], l_shipmode: [AIR], l_comment: [p blithely after ]
l_orderkey: [481], l_partkey: [1128], l_suppkey: [93], l_linestatus: [5], l_quantity: [31], l_extendedprice: [31654.7], l_discount: [0.05], l_tax: [0.01], l_returnflag: [A], l_linestatus: [F], l_shipdate: [1993-01-15], l_commitdate: [1992-12-31], l_receiptdate: [1993-01-21], l_shipinstruct: [DELIVER IN PERSON], l_shipmode: [AIR], l_comment: [ustly final packages believe. quick]
```

```
l_orderkey: [738], l_partkey: [1749], l_suppkey: [34], l_linestatus: [5], l_quantity: [30], l_extendedprice: [49522.2], l_discount: [0.02], l_tax: [0], l_returnflag: [A], l_linestatus: [F], l_shipdate: [1993-06-12], l_commitdate: [1993-05-29], l_receiptdate: [1993-06-25], l_shipinstruct: [NONE], l_shipmode: [AIR], l_comment: [acial instructions haggle blithely regula r packages. b]
l_orderkey: [132], l_partkey: [281], l_suppkey: [63], l_linestatus: [4], l_quantity: [23], l_extendedprice: [27169.4], l_discount: [0.1], l_tax: [0], l_returnflag: [A], l_linestatus: [F], l_shipdate: [1993-06-16], l_commitdate: [1993-08-27], l_receiptdate: [1993-06-23], l_shipinstruct: [DELIVER IN PERSON], l_shipmode: [AIR], l_comment: [refully blithely bold acco]
l_orderkey: [738], l_partkey: [1871], l_suppkey: [72], l_linestatus: [2], l_quantity: [4], l_extendedprice: [7091.48], l_discount: [0], l_tax: [0.03], l_returnflag: [A], l_linestatus: [F], l_shipdate: [1993-06-20], l_commitdate: [1993-04-08], l_receiptdate: [1993-07-09], l_shipinstruct: [NONE], l_shipmode: [AIR], l_comment: [ar packages. fluffily bo]
l_orderkey: [261], l_partkey: [1740], l_suppkey: [25], l_linestatus: [3], l_quantity: [26], l_extendedprice: [45968.7], l_discount: [0.08], l_tax: [0.03], l_returnflag: [R], l_linestatus: [F], l_shipdate: [1993-07-24], l_commitdate: [1993-08-20], l_receiptdate: [1993-08-05], l_shipinstruct: [COLLECT COO], l_shipmode: [AIR], l_comment: [ironic packages nag slyly. careful ly fin]
l_orderkey: [294], l_partkey: [597], l_suppkey: [88], l_linestatus: [1], l_quantity: [31], l_extendedprice: [46425.3], l_discount: [0], l_tax: [0.01], l_returnflag: [R], l_linestatus: [F], l_shipdate: [1993-08-06], l_commitdate: [1993-08-19], l_receiptdate: [1993-08-13], l_shipinstruct: [TAKE BACK RETURN], l_shipmode: [AIR], l_comment: [Te fluffily along the quick]
l_orderkey: [769], l_partkey: [1751], l_suppkey: [94], l_linestatus: [1], l_quantity: [36], l_extendedprice: [59499], l_discount: [0.02], l_tax: [0.02], l_returnflag: [A], l_linestatus: [F], l_shipdate: [1993-10-01], l_commitdate: [1993-08-07], l_receiptdate: [1993-10-15], l_shipinstruct: [NONE], l_shipmode: [AIR], l_comment: [es. furiously iro]
l_orderkey: [261], l_partkey: [970], l_suppkey: [5], l_linestatus: [6], l_quantity: [20], l_extendedprice: [37419.4], l_discount: [0.06], l_tax: [0.06], l_returnflag: [A], l_linestatus: [F], l_shipdate: [1993-10-15], l_commitdate: [1993-09-05], l_receiptdate: [1993-11-07], l_shipinstruct: [NONE], l_shipmode: [AIR], l_comment: [ing to the special, ironic deposit]
l_orderkey: [416], l_partkey: [1742], l_suppkey: [85], l_linestatus: [3], l_quantity: [25], l_extendedprice: [41093.5], l_discount: [0.07], l_tax: [0.01], l_returnflag: [R], l_linestatus: [F], l_shipdate: [1993-10-16], l_commitdate: [1993-12-03], l_receiptdate: [1993-10-29], l_shipinstruct: [NONE], l_shipmode: [AIR], l_comment: [ses boost after the bold requests.]
l_orderkey: [258], l_partkey: [1465], l_suppkey: [5], l_linestatus: [6], l_quantity: [36], l_extendedprice: [44912.6], l_discount: [0.09], l_tax: [0.04], l_returnflag: [A], l_linestatus: [F], l_shipdate: [1994-01-11], l_commitdate: [1994-03-04], l_receiptdate: [1994-01-18], l_shipinstruct: [DELIVER IN PERSON], l_shipmode: [AIR], l_comment: [nic asymptotes. slyly silent]
l_orderkey: [677], l_partkey: [1497], l_suppkey: [15], l_linestatus: [5], l_quantity: [25], l_extendedprice: [34962.2], l_discount: [0], l_tax: [0.05], l_returnflag: [A], l_linestatus: [F], l_shipdate: [1994-03-12], l_commitdate: [1994-02-02], l_receiptdate: [1994-03-28], l_shipinstruct: [DELIVER IN PERSON], l_shipmode: [AIR], l_comment: [ packages integrate blithely]
l_orderkey: [353], l_partkey: [1194], l_suppkey: [67], l_linestatus: [1], l_quantity: [41], l_extendedprice: [44902.8], l_discount: [0], l_tax: [0.06], l_returnflag: [A], l_linestatus: [F], l_shipdate: [1994-03-25], l_commitdate: [1994-03-31], l_receiptdate: [1994-03-30], l_shipinstruct: [DELIVER IN PERSON], l_shipmode: [AIR], l_comment: [refully final theodol]
l_orderkey: [548], l_partkey: [568], l_suppkey: [59], l_linestatus: [4], l_quantity: [21], l_extendedprice: [30839.8], l_discount: [0.00], l_tax: [0.03], l_returnflag: [A], l_linestatus: [F], l_shipdate: [1994-10-27], l_commitdate: [1994-12-04], l_receiptdate: [1994-11-23], l_shipinstruct: [DELIVER IN PERSON], l_shipmode: [AIR], l_comment: [ engage quickly. regular theo]
l_orderkey: [295], l_partkey: [914], l_suppkey: [17], l_linestatus: [2], l_quantity: [26], l_extendedprice: [47187.7], l_discount: [0.04], l_tax: [0.03], l_returnflag: [R], l_linestatus: [F], l_shipdate: [1994-12-13], l_commitdate: [1994-11-30], l_receiptdate: [1995-01-06], l_shipinstruct: [DELIVER IN PERSON], l_shipmode: [AIR], l_comment: [ts above the slyly regular re quests x-ray c]
l_orderkey: [960], l_partkey: [1870], l_suppkey: [6], l_linestatus: [1], l_quantity: [1], l_extendedprice: [971.07], l_discount: [0.07], l_tax: [0], l_returnflag: [A], l_linestatus: [F], l_shipdate: [1994-12-24], l_commitdate: [1994-10-26], l_receiptdate: [1995-01-20], l_shipinstruct: [DELIVER IN PERSON], l_shipmode: [AIR], l_comment: [y ironic packages. quickly even ]
l_orderkey: [742], l_partkey: [1919], l_suppkey: [64], l_linestatus: [4], l_quantity: [16], l_extendedprice: [29134.6], l_discount: [0.01], l_tax: [0.05], l_returnflag: [A], l_linestatus: [F], l_shipdate: [1995-01-15], l_commitdate: [1995-02-25], l_receiptdate: [1995-01-24], l_shipinstruct: [COLLECT COO], l_shipmode: [AIR], l_comment: [eodolites haggle carefully regul]
l_orderkey: [602], l_partkey: [1328], l_suppkey: [29], l_linestatus: [2], l_quantity: [54], l_extendedprice: [41796.9], l_discount: [0.00], l_tax: [0.06], l_returnflag: [A], l_linestatus: [F], l_shipdate: [1995-03-01], l_commitdate: [1995-03-15], l_receiptdate: [1995-03-12], l_shipinstruct: [COLLECT COO], l_shipmode: [AIR], l_comment: [structions cajole carefully. qui etl]
l_orderkey: [450], l_partkey: [781], l_suppkey: [82], l_linestatus: [5], l_quantity: [2], l_extendedprice: [3363.56], l_discount: [0.09], l_tax: [0], l_returnflag: [A], l_linestatus: [F], l_shipdate: [1995-03-11], l_commitdate: [1995-05-21], l_receiptdate: [1995-03-16], l_shipinstruct: [COLLECT COO], l_shipmode: [AIR], l_comment: [y even pinto beans; qui]
l_orderkey: [930], l_partkey: [173], l_suppkey: [52], l_linestatus: [2], l_quantity: [47], l_extendedprice: [50439], l_discount: [0.08], l_tax: [0], l_returnflag: [A], l_linestatus: [F], l_shipdate: [1995-03-20], l_commitdate: [1995-02-04], l_receiptdate: [1995-04-04], l_shipinstruct: [DELIVER IN PERSON], l_shipmode: [AIR], l_comment: [ackages. fluffily e]
l_orderkey: [577], l_partkey: [259], l_suppkey: [14], l_linestatus: [1], l_quantity: [25], l_extendedprice: [28981.2], l_discount: [0.06], l_tax: [0.01], l_returnflag: [A], l_linestatus: [F], l_shipdate: [1995-04-09], l_commitdate: [1995-02-20], l_receiptdate: [1995-05-09], l_shipinstruct: [TAKE BACK RETURN], l_shipmode: [AIR], l_comment: [ive slyly of the frets. careful]
l_orderkey: [928], l_partkey: [184], l_suppkey: [31], l_linestatus: [7], l_quantity: [11], l_extendedprice: [11845.1], l_discount: [0], l_tax: [0.01], l_returnflag: [A], l_linestatus: [F], l_shipdate: [1995-04-29], l_commitdate: [1995-04-16], l_receiptdate: [1995-04-30], l_shipinstruct: [NONE], l_shipmode: [AIR], l_comment: [longside of]
l_orderkey: [327], l_partkey: [418], l_suppkey: [48], l_linestatus: [2], l_quantity: [9], l_extendedprice: [11865.7], l_discount: [0.09], l_tax: [0.05], l_returnflag: [A], l_linestatus: [F], l_shipdate: [1995-05-24], l_commitdate: [1995-07-11], l_receiptdate: [1995-06-05], l_shipinstruct: [NONE], l_shipmode: [AIR], l_comment: [ asymptotes are fu]
```

query over linetitem.bin returned 35 rows

Google Test Results:

```
neel@nrami:~/Desktop/DBI/Projects/Project2.1/bin$ ./gTestProj21
[=====] Running 7 tests from 7 test cases.
[-----] Global test environment set-up.
[-----] 1 test from SFCreateTest
[ RUN      ] SFCreateTest.SubTest1
[       OK ] SFCreateTest.SubTest1 (0 ms)
[-----] 1 test from SFCreateTest (1 ms total)

[-----] 1 test from SFOpenTest
[ RUN      ] SFOpenTest.SubTest1
[       OK ] SFOpenTest.SubTest1 (34 ms)
[-----] 1 test from SFOpenTest (34 ms total)

[-----] 1 test from SFMoveFirstTest
[ RUN      ] SFMoveFirstTest.SubTest1
[       OK ] SFMoveFirstTest.SubTest1 (3 ms)
[-----] 1 test from SFMoveFirstTest (3 ms total)

[-----] 1 test from SFAddTest
[ RUN      ] SFAddTest.SubTest1
[       OK ] SFAddTest.SubTest1 (2 ms)
[-----] 1 test from SFAddTest (2 ms total)

[-----] 1 test from SFLoadTest
[ RUN      ] SFLoadTest.SubTest1
[       OK ] SFLoadTest.SubTest1 (2 ms)
[-----] 1 test from SFLoadTest (2 ms total)

[-----] 1 test from GetNext1Test
[ RUN      ] GetNext1Test.SubTest1
[       OK ] GetNext1Test.SubTest1 (2 ms)
[-----] 1 test from GetNext1Test (2 ms total)

[-----] 1 test from GetNext2Test
[ RUN      ] GetNext2Test.SubTest1
[       OK ] GetNext2Test.SubTest1 (2 ms)
[-----] 1 test from GetNext2Test (2 ms total)

[-----] Global test environment tear-down
[=====] 7 tests from 7 test cases ran. (47 ms total)
[ PASSED  ] 7 tests.
neel@nrami:~/Desktop/DBI/Projects/Project2.1/bin$
```