

COP6726 – Database System Implementation – Project 1 Report

Team members:

1. Akshay Ganapathy (UFID: 3684-6922)
2. Riyaz Shaik (UFID: 4360-0170)

Steps to execute project code:

1. Download and extract “AkshayGanapathy_RiyazShaik_p1.zip” file. Its contents include the following:
 - a. Project code needed to run test.cc and main.cc. To run main.cc, include “lineitem.tbl” file in folder “tpch-dbgen” in the project root.
 - b. All “.bin” files have been included in the “bin” folder.
 - c. Google test framework has been added in the directory “googletest”. This framework is needed to run gtest unit test cases.
 - d. All the gtest unit test cases have been added in “test” folder. DBFileTest.cc contains the unit test cases for DBFile::Create, DBFile::Open and DBFile::Close methods.
 - e. Makefile to compile main.cc, test.cc and gtest unit test cases.
2. To run test.cc, from project root execute command “make test.out” and then execute “./test.out” and follow the on-screen instructions.

This test driver gives a menu-based interface to three options that allows you to test the code:

1. load (read a tpch file and write a heap DBFile)
 2. scan (read records from an existing heap DBFile)
 3. scan & filter (read records and filter using a CNF predicate)
3. To run main.cc, from project root execute command “make main” and then execute “./main” and follow the on-screen instructions.
 4. To run gtest unit test cases, from project root execute command “make gtests” and then execute “./gtests”.

The following are the methods with their description:

Method	Description
int Create(const char *fpath, fType file_type, void *startup)	Creates the corresponding database file from the path in “fpath”. Returns 1 on successful open; 0 on failed.
int Open(const char *fpath)	Opens database file. Returns 1 on success; 0 on failure.
int Close()	Closes database file. Returns 1 on success; 0 on failure.
void Load(Schema &myschema, const char *loadpath)	Loads the .tbl file into a database file having a set of pages. Each page contains a set of records.
void MoveFirst()	Moves the file pointer to point the first record in the first page.
void Add(Record &addme)	Adds a record to the database file. The new record is added to the end of the last available page.

int GetNext(Record &fetchme)	Gets the next record in the file. Returns 1 if record is present; 0 if file is empty.
int GetNext(Record &fetchme, CNF &cnf, Record &literal)	Gets the record which matches the cnf expression. Returns 1 if record is present; 0 otherwise

The following are the “test.out” results with screenshots attached:

1. q1: (r_name = 'EUROPE')

Result: 1 record retrieved

```

** IMPORTANT: MAKE SURE THE INFORMATION BELOW IS CORRECT **
catalog location:      catalog
tpch files dir:        tpch-dbggen/
heap files dir:        bin/

select test:
  1. load file
  2. scan
  3. scan & filter
  3

select table:
  1. nation
  2. region
  3. customer
  4. part
  5. partsupp
  6. orders
  7. lineitem
  2
Filter with CNF for : region

Enter CNF predicate (when done press ctrl-D):

(r_name = 'EUROPE')File present at path: bin/region.bin is now opened.
Moved to first Page in Database File
r_regionkey: [3], r_name: [EUROPE], r_comment: [ly final courts cajole furiously final excuse]
Selected 1 recs
riyaz@Riyaz-PC:/mnt/d/UFL/coursework/Spring 2021/COP6726 Database System Implementation/project/AkshayGanapathy_RiyazShaik_p1$

```

2. q2: (r_name < 'middle east') AND (r_regionkey > 1)

Result: 3 records retrieved

```

** IMPORTANT: MAKE SURE THE INFORMATION BELOW IS CORRECT **
catalog location:      catalog
tpch files dir:        tpch-dbggen/
heap files dir:        bin/

select test:
  1. load file
  2. scan
  3. scan & filter
  3

select table:
  1. nation
  2. region
  3. customer
  4. part
  5. partsupp
  6. orders
  7. lineitem
  2
Filter with CNF for : region

Enter CNF predicate (when done press ctrl-D):

(r_name < 'middle east') AND (r_regionkey > 1)File present at path: bin/region.bin is now opened.
Moved to first Page in Database File
r_regionkey: [2], r_name: [ASIA], r_comment: [ges. thinly even pinto beans ca]
r_regionkey: [3], r_name: [EUROPE], r_comment: [ly final courts cajole furiously final excuse]
r_regionkey: [4], r_name: [MIDDLE EAST], r_comment: [uickly special accounts cajole carefully blithely close requests. carefully final asymptotes haggle furiously]
Selected 3 recs
riyaz@Riyaz-PC:/mnt/d/UFL/coursework/Spring 2021/COP6726 Database System Implementation/project/AkshayGanapathy_RiyazShaik_p1$

```

3. q3: (n_regionkey = 3) AND (n_nationkey > 10) AND (n_name > 'japan')

Result: 0 records retrieved

```
** IMPORTANT: MAKE SURE THE INFORMATION BELOW IS CORRECT **
catalog location:      catalog
tpch files dir:        tpch-dbggen/
heap files dir:        bin/

select test:
  1. load file
  2. scan
  3. scan & filter
  3

select table:
  1. nation
  2. region
  3. customer
  4. part
  5. partsupp
  6. orders
  7. lineitem
  1
Filter with CNF for : nation

Enter CNF predicate (when done press ctrl-D):

(n_regionkey = 3) AND (n_nationkey > 10) AND (n_name > 'japan')File present at path: bin/nation.bin is now opened.
Moved to first Page in Database File
Selected 0 recs
riyaz@Riyaz-PC:/mnt/d/UFL/coursework/Spring 2021/COP6726 Database System Implementation/project/AkshayGanapathy_RiyazShaik_p1$
```

4. q11: (l_shipdate > '1994-01-01') AND (l_shipdate < '1994-01-07') AND (l_discount > 0.05) AND (l_discount < 0.06) AND (l_quantity = 4.0)

Result: 0 records retrieved

```
** IMPORTANT: MAKE SURE THE INFORMATION BELOW IS CORRECT **
catalog location:      catalog
tpch files dir:        tpch-dbggen/
heap files dir:        bin/

select test:
  1. load file
  2. scan
  3. scan & filter
  3

select table:
  1. nation
  2. region
  3. customer
  4. part
  5. partsupp
  6. orders
  7. lineitem
  7
Filter with CNF for : lineitem

Enter CNF predicate (when done press ctrl-D):

(l_shipdate > '1994-01-01') AND (l_shipdate < '1994-01-07') AND (l_discount > 0.05) AND (l_discount < 0.06) AND (l_quantity = 4.0)
File present at path: bin/lineitem.bin is now opened.
Moved to first Page in Database File
Selected 0 recs
riyaz@Riyaz-PC:/mnt/d/UFL/coursework/Spring 2021/COP6726 Database System Implementation/project/AkshayGanapathy_RiyazShaik_p1$
```

5. q12: (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)

Result: 35 record retrieved

```
** IMPORTANT: MAKE SURE THE INFORMATION BELOW IS CORRECT **
catalog location:      catalog
tpch files dir:       tpch-dbggen/
heap files dir:       bin/

select test:
  1. load file
  2. scan
  3. scan & filter
  3

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

Filter with CNF for : lineitem

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)
File present at path: bin/lineitem.bin is now opened.
Moved to first Page in Database File
l_orderkey: [132], l_partkey: [281], l_suppkey: [63], l_linenum: [4], l_quantity: [23], l_extendedprice: [27169.4], l_discount: [0.1], l_tax: [0], l_returnstatus: [F], l_receiptdate: [1993-06-23], l_shipinstruct: [DELIVER IN PERSON], l_shipmode: [AIR], l_comment: [refully blithely bold acco]
l_orderkey: [164], l_partkey: [185], l_suppkey: [38], l_linenum: [2], l_quantity: [24], l_extendedprice: [26044.3], l_discount: [0.05], l_tax: [0.05], l_returnstatus: [F], 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: [1256], l_suppkey: [68], l_linenum: [3], l_quantity: [38], l_extendedprice: [43975.5], l_discount: [0.03], l_tax: [0.06], l_returnstatus: [F], l_receiptdate: [1993-01-02], l_shipinstruct: [TAKE BACK RETURN], l_shipmode: [AIR], l_comment: [counts cajole fluffily regular packages. b]
l_orderkey: [164], l_partkey: [1089], l_suppkey: [90], l_linenum: [6], l_quantity: [27], l_extendedprice: [26732.2], l_discount: [0.1], l_tax: [0.04], l_returnstatus: [F], l_receiptdate: [1993-01-10], l_shipinstruct: [DELIVER IN PERSON], l_shipmode: [AIR], l_comment: [ayers wake carefully a]
l_orderkey: [226], l_partkey: [407], l_suppkey: [95], l_linenum: [4], l_quantity: [45], l_extendedprice: [58833], l_discount: [0.1], l_tax: [0.02], l_returnstatus: [F], l_receiptdate: [1993-05-11], l_shipinstruct: [DELIVER IN PERSON], l_shipmode: [AIR], l_comment: [ carefully pending pi]
l_orderkey: [258], l_partkey: [1465], l_suppkey: [5], l_linenum: [6], l_quantity: [36], l_extendedprice: [49192.6], l_discount: [0.09], l_tax: [0.04], l_returnstatus: [F], l_receiptdate: [1994-01-18], l_shipinstruct: [DELIVER IN PERSON], l_shipmode: [AIR], l_comment: [nic asymptotes. slyly silent r]
l_orderkey: [481], l_partkey: [207], l_suppkey: [8], l_linenum: [2], l_quantity: [19], l_extendedprice: [21036.8], l_discount: [0.08], l_tax: [0.01], l_returnstatus: [F], l_receiptdate: [1993-01-14], l_shipinstruct: [TAKE BACK RETURN], l_shipmode: [AIR], l_comment: [p blithely after t]
l_orderkey: [481], l_partkey: [1120], l_suppkey: [93], l_linenum: [5], l_quantity: [31], l_extendedprice: [31654.7], l_discount: [0.05], l_tax: [0.01], l_returnstatus: [F], l_receiptdate: [1993-01-21], l_shipinstruct: [DELIVER IN PERSON], l_shipmode: [AIR], l_comment: [usly final packages believe. quick]
l_orderkey: [548], l_partkey: [568], l_suppkey: [59], l_linenum: [4], l_quantity: [21], l_extendedprice: [30839.8], l_discount: [0.08], l_tax: [0.03], l_returnstatus: [F], l_receiptdate: [1994-11-21], l_shipinstruct: [DELIVER IN PERSON], l_shipmode: [AIR], l_comment: [ engage quickly. regular theo]
l_orderkey: [549], l_partkey: [653], l_suppkey: [54], l_linenum: [2], l_quantity: [36], l_extendedprice: [55931.4], l_discount: [0.08], l_tax: [0.04], l_returnstatus: [F], l_receiptdate: [1992-09-12], l_shipinstruct: [DELIVER IN PERSON], l_shipmode: [AIR], l_comment: [ts against the ironic, even theodolites eng]
l_orderkey: [577], l_partkey: [259], l_suppkey: [14], l_linenum: [1], l_quantity: [25], l_extendedprice: [28981.2], l_discount: [0.06], l_tax: [0.01], l_returnstatus: [F], l_receiptdate: [1995-05-05], l_shipinstruct: [TAKE BACK RETURN], l_shipmode: [AIR], l_comment: [ve slyly of the frets. careful]
l_orderkey: [677], l_partkey: [1497], l_suppkey: [15], l_linenum: [5], l_quantity: [25], l_extendedprice: [34962.2], l_discount: [0], l_tax: [0.05], l_returnstatus: [F], l_receiptdate: [1994-03-28], l_shipinstruct: [DELIVER IN PERSON], l_shipmode: [AIR], l_comment: [ packages integrate blithely]
l_orderkey: [678], l_partkey: [975], l_suppkey: [76], l_linenum: [5], l_quantity: [16], l_extendedprice: [30015.5], l_discount: [0.06], l_tax: [0.04], l_returnstatus: [F], l_receiptdate: [1993-04-07], l_shipinstruct: [NONE], l_shipmode: [AIR], l_comment: [ about the ]
l_orderkey: [738], l_partkey: [1871], l_suppkey: [72], l_linenum: [2], l_quantity: [4], l_extendedprice: [7091.48], l_discount: [0], l_tax: [0.03], l_returnstatus: [F], l_receiptdate: [1993-07-09], l_shipinstruct: [NONE], l_shipmode: [AIR], l_comment: [an packages. fluffily bo]
l_orderkey: [738], l_partkey: [1749], l_suppkey: [34], l_linenum: [5], l_quantity: [30], l_extendedprice: [49522.2], l_discount: [0.02], l_tax: [0], l_returnstatus: [F], l_receiptdate: [1993-06-25], l_shipinstruct: [NONE], l_shipmode: [AIR], l_comment: [ecial instructions haggle blithely regula]
l_orderkey: [742], l_partkey: [1919], l_suppkey: [64], l_linenum: [4], l_quantity: [16], l_extendedprice: [29134.6], l_discount: [0.01], l_tax: [0.05], l_returnstatus: [F], l_receiptdate: [1995-01-24], l_shipinstruct: [COLLECT COD], l_shipmode: [AIR], l_comment: [eodolites haggle carefully regul]
l_orderkey: [769], l_partkey: [1751], l_suppkey: [94], l_linenum: [1], l_quantity: [36], l_extendedprice: [59499], l_discount: [0.02], l_tax: [0.02], l_returnstatus: [F], l_receiptdate: [1993-10-15], l_shipinstruct: [NONE], l_shipmode: [AIR], l_comment: [es. furiously iro]
l_orderkey: [772], l_partkey: [1799], l_suppkey: [26], l_linenum: [4], l_quantity: [10], l_extendedprice: [17007.9], l_discount: [0.08], l_tax: [0.02], l_returnstatus: [F], l_receiptdate: [1993-05-29], l_shipinstruct: [COLLECT COD], l_shipmode: [AIR], l_comment: [o the furiously final deposits. furi]
l_orderkey: [801], l_partkey: [947], l_suppkey: [16], l_linenum: [2], l_quantity: [21], l_extendedprice: [38806.7], l_discount: [0.05], l_tax: [0.02], l_returnstatus: [F], l_receiptdate: [1992-04-05], l_shipinstruct: [COLLECT COD], l_shipmode: [AIR], l_comment: [wake silently furiously idle deposits. ]
l_orderkey: [802], l_partkey: [1328], l_suppkey: [29], l_linenum: [2], l_quantity: [34], l_extendedprice: [41796.9], l_discount: [0.08], l_tax: [0.06], l_returnstatus: [F], l_receiptdate: [1995-03-12], l_shipinstruct: [COLLECT COD], l_shipmode: [AIR], l_comment: [instructions cajole carefully. quietl]
l_orderkey: [866], l_partkey: [1358], l_suppkey: [59], l_linenum: [1], l_quantity: [5], l_extendedprice: [6296.75], l_discount: [0.08], l_tax: [0], l_returnstatus: [F], l_receiptdate: [1993-02-07], l_shipinstruct: [TAKE BACK RETURN], l_shipmode: [AIR], l_comment: [tegrate fluffily. carefully f]
l_orderkey: [928], l_partkey: [104], l_suppkey: [31], l_linenum: [7], l_quantity: [11], l_extendedprice: [11045.1], l_discount: [0], l_tax: [0.01], l_returnstatus: [F], l_receiptdate: [1995-04-30], l_shipinstruct: [NONE], l_shipmode: [AIR], l_comment: [longside of]
l_orderkey: [930], l_partkey: [173], l_suppkey: [52], l_linenum: [2], l_quantity: [47], l_extendedprice: [50439], l_discount: [0.08], l_tax: [0], l_returnstatus: [F], l_receiptdate: [1995-04-04], l_shipinstruct: [DELIVER IN PERSON], l_shipmode: [AIR], l_comment: [ackages. fluffily e]
l_orderkey: [933], l_partkey: [992], l_suppkey: [27], l_linenum: [3], l_quantity: [26], l_extendedprice: [49217.7], l_discount: [0.05], l_tax: [0], l_returnstatus: [F], l_receiptdate: [1992-11-16], l_shipinstruct: [DELIVER IN PERSON], l_shipmode: [AIR], l_comment: [ the deposits affix slyly after t]
l_orderkey: [960], l_partkey: [1070], l_suppkey: [6], l_linenum: [1], l_quantity: [1], l_extendedprice: [971.07], l_discount: [0.07], l_tax: [0], l_returnstatus: [F], l_receiptdate: [1995-01-20], l_shipinstruct: [DELIVER IN PERSON], l_shipmode: [AIR], l_comment: [y ironic packages. quickly even ]
Selected 35 recs
riyaz@Riyaz-PC:/mnt/d/UFL/coursework/Spring 2021/COP6726 Database System Implementation/project/AkshayGanapathy_RiyazShaik_p1$
```

The following are the results of gtest unit test cases:

Result: All the unit test cases passed

The test files are present in “test/DBFileTest.cc” file. DBFileTest.cc contains the unit test cases for DBFile::Create, DBFile::Open and DBFile::Close methods.

To run gtest unit test cases, from project root execute command “make gtests” and then execute “./gtests”.

We have written unit test cases for the 3 methods above covering both success and failure scenarios.

```
riyaz@Riyaz-PC:/mnt/d/UFL/coursework/Spring 2021/COP6726 Database System Implementation/project/AkshayGanapathy_RiyazShaik_p1$ ./gtests
Running main() from googletest/googletest/src/gtest_main.cc
[*****] Running 6 tests from 1 test suite.
[*****] Global test environment set-up.
[*****] 6 tests from DBFileTest
[ RUN    ] DBFileTest.testCreateSuccess
File created successfully
[ OK     ] DBFileTest.testCreateSuccess (1 ms)
[ RUN    ] DBFileTest.testCreateFailure
File created successfully
[ OK     ] DBFileTest.testCreateFailure (0 ms)
[ RUN    ] DBFileTest.testOpenSuccess
File created successfully
File present at path: test/data/lineitem.tbl is now opened.
[ OK     ] DBFileTest.testOpenSuccess (0 ms)
[ RUN    ] DBFileTest.testOpenFailure
ERROR: File does not exist or could not be opened
[ OK     ] DBFileTest.testOpenFailure (1 ms)
[ RUN    ] DBFileTest.testCloseSuccess
File present at path: test/data/lineitem.tbl is now opened.
[ OK     ] DBFileTest.testCloseSuccess (56 ms)
[ RUN    ] DBFileTest.testCloseFailure
In DBFile::Close(), ERROR: File does not exist
[ OK     ] DBFileTest.testCloseFailure (1 ms)
[*****] 6 tests from DBFileTest (62 ms total)

[*****] Global test environment tear-down
[*****] 6 tests from 1 test suite ran. (64 ms total)
[ PASSED ] 6 tests.
riyaz@Riyaz-PC:/mnt/d/UFL/coursework/Spring 2021/COP6726 Database System Implementation/project/AkshayGanapathy_RiyazShaik_p1$
```