COP6726 DATABASE SYSTEM IMPLEMENTATION PROJECT 2 MILESTONE 2 REPORT

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To run the code:

- Compile the test.cc using the command make test.cc and then run it using ./test.out.
- Compile the gTest.cc which consists of four test cases using the command make gTest.out and run it using ./gTest.out.
- Compile the shell script which consists of three test cases using sh runTestCases.sh. Run them using ./runTestCases.sh.

FUNCTION DESCRIPTION:

We have implemented all the functions mentioned in the task

int Open (char *name)

We have opened a file with the file name=name which opens the file if it already exists or creates a new file. And point to first record.

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

- name denotes the name of the file
- myType indicates type of the file which is either heap or sorted in the current scenario
- startup is a structure type with variables myOrder and runLength

We have opened a file with the file name=name which opens the file if it already exists or creates a new file of file type=myType. We initialize our pointer to current data page index with -1 and empty out the current page and return 1 on success and 0 on failure.

void Add (Record &addMe)

It is a function to add the given record to the file and increase the current length by 1.

void Load (Schema &mySchema, char *loadMe)

We open the file with file name=loadMe and store it in data_file. Then we create a new page instance and store all the records in that data file and increment the current data page index with every record inserted in the file.

void MoveFirst()

If length is greater than 1 then loads the first page and make the current data page index to 0 which indicates that the pointer is in first page.

int GetNext (Record &fetchMe)

We use a GetLength method to get the current length. Then initliaze a pointer which indicates the last page index with current length -2. We use GetNextRecord() to fetch the next record till the last page index is reached and return the current status of the GetNextRecord().

int GetNext(Record &fetchMe, CNF &applyMe, Record &literal)

We run a loop till GetNext() returns positive number and then we compare each record using ComparisionEngine and select the record if it satisfies the selection predicate(CNF).

int Close()

We close the file and store the output in state and set current data page index to point to null(-1). We empty the current page and return the state.

TESTCASES

TestCase 1:

1

1

(n_regionkey)

16

Output:

```
nikhil@DESKTOP-G3LL7I1:/mnt/c/Users/Dhanjay/Desktop/Project2_part2$ ./test.out

** IMPORTANT: MAKE SURE THE INFORMATION BELOW IS CORRECT **
catalog location:      catalog
tpch files dir:
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_regionkey)

specify runlength:
        16

output to dbfile : nation.bin
input from file : 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
```

TestCase 2:

2

1

Output:

TestCase 3:

1

3

(c_phone)

8

Output:

```
nikhil@DESKTOP-G3LL7I1:/mnt/c/Users/Dhanjay/Desktop/Project2_part2$ ./test.out

** IMPORTANT: MAKE SURE THE INFORMATION BELOW IS CORRECT **
 catalog location:      catalog
 tpch files dir:
 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
        3

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

specify runlength:
        8

output to dbfile : customer.bin
input from file : customer.tbl

select option for : customer.bin
        1. add a few (1 to 1k recs)
        2. add a lot (1k to 1e+06 recs)
        3. run some query
        2
        .......
        added 150000 recs..so far 150000

create finished.. 150000 recs inserted
```

TestCase 4:

2

3

Output:

.c_custkey: [66195], c_name: [Customer#000066195], c_address: [,YgacKY1JreSUSldygu1E348MuAnxXayLTuS], c_nationkey: [24], c_phone: [34-995-870-2299], c_acctbal: [5186.45], c_mktsegment: [FURNITURE], c_comment: [furiously pending theodolit es sleep after th]
.c_custkey: [74263], c_name: [Customer#000074263], c_address: [8BKuJXq4Ab1nXGOnJ,Sot6 ,ommnxsDyGVYOJf], c_nationkey: [24], c_phone: [34-995-950-2170], c_acctbal: [7003.79], c_mktsegment: [MACHINERY], c_comment: [unts impress. slyly final foxes haggle carefully around the unusua]
.c_custkey: [88858], c_name: [Customer#000088858], c_address: [1Mshbshapj], c_nationkey: [24], c_phone: [34-996-605-1799], c_acctbal: [6066.8], c_mktsegment: [AUTOMOBILE], c_comment: [theodolites after the fluffily pending theodolites bo ost bold accounts. furiously regular orbits cajole regular1]
.c_custkey: [139443], c_name: [Customer#000139443], c_address: [26MgKUkBcs,SP LtunUm3VV3O,bvyaJv2HBOM], c_nationkey: [24], c_phone: [34-996-663-4470], c_acctbal: [-395.28], c_mktsegment: [BUILDING], c_comment: [olphins integrate blithely carefully pending pinto beans. pending pl]
.c_custkey: [37326], c_name: [Customer#000037326], c_address: [DQK3cxIC7H29vdSkLTHah0kHOPjfUUS], c_nationkey: [24], c_phone: [34-996-695-7639], c_acctbal: [3155.24], c_mktsegment: [HOUSEHOLD], c_comment: [inal accounts sleep slyly regula r pains. c]
.c_custkey: [25905], c_name: [Customer#000025905], c_address: [m wWlOO AZTfsAYbRctOZDAoUe], c_nationkey: [24], c_phone: [34-996-827-5819], c_acctbal: [6393.05], c_mktsegment: [BUILDING], c_comment: [sly across the blithely even deposits. slyly pending excuses nag slyly. packages]
.c_custkey: [6048], c_name: [Customer#000006048], c_address: [DNtLkGdov3MnFfAGa40Pl6c6Y1r5j NF], c_nationkey: [24], c_phone: [34-996-904-3634], c_acctbal: [2634.46], c_mktsegment: [AUTOMOBILE], c_comment: [sleep blithely across the regu lar deposits. accounts wake. slyly ironic gifts above th]
.c_custkey: [2068], c_name: [Customer#000002068], c_address: [q3hQ8nHhhsJ2n], c_nationkey: [24], c_phone: [34-996-906-1652], c_acctbal: [-839.34], c_mktsegment: [HOUSEHOLD], c_comment: [the closely express excuses wake furiously furious ly special requ]
.c_custkey: [101355], c_name: [Customer#000101355], c_address: [s3StaX90lFOW], c_nationkey: [24], c_phone: [34-997-108-0666], c_acctbal: [32.59], c_mktsegment: [FURNITURE], c_comment: [even sheaves wake quickly expr]
.c_custkey: [37088], c_name: [Customer#000037088], c_address: [I2kfDo3fodN6YonS0MJsS], c_nationkey: [24], c_phone: [34-997-284-5897], c_acctbal: [2484.13], c_mktsegment: [AUTOMOBILE], c_comment: [al theodolites haggle across the quickly th]
.c_custkey: [3174], c_name: [Customer#000003174], c_address: [9XGPFK1WZMU], c_nationkey: [24], c_phone: [34-997-244-3200], c_acctbal: [6117.29], c_mktsegment: [BUILDING], c_comment: [round the furiously express packages. furiously regula r courts are furio]
.c_custkey: [86364], c_name: [Customer#000086364], c_address: [vMKeNm EzZa75U3vkmI2RnpeJC9], c_nationkey: [24], c_phone: [34-997-251-4190], c_acctbal: [2691.67], c_mktsegment: [AUTOMOBILE], c_comment: [even foxes haggle quickly blithely regular pinto beans. slyly regular ideas sleep slyly along the f]
.c_custkey: [35286], c_name: [Customer#000035286], c_address: [P HN6QXTmlBpJ5Xps], c_nationkey: [24], c_phone: [34-997-517-4660], c_acctbal: [120.81], c_mktsegment: [AUTOMOBILE], c_comment: [und the permanent packages sleep blithely acc ording to the special, even requests. express foxes]
.c_custkey: [48253], c_name: [Customer#000048253], c_address: [gAVusA89FVBERzgQoz S1Qc9wVkO7gYX1TLRkG], c_nationkey: [24], c_phone: [34-997-697-4316], c_acctbal: [4429.09], c_mktsegment: [AUTOMOBILE], c_comment: [express forges use after the carefully ironic ideas. slyly express foxes sleep quickly. carefully special]
.c_custkey: [31537], c_name: [Customer#000031537], c_address: [82Fr5r7gWxt2a5], c_nationkey: [24], c_phone: [34-998-190-8709], c_acctbal: [-252.7], c_mktsegment: [HOUSEHOLD], c_comment: [ructions cajole ideas. slyly express depos]
.c_custkey: [117513], c_name: [Customer#000117513], c_address: [cuBZ TE0EONnPFmoOdvGE1HxKU43AV], c_nationkey: [24], c_phone: [34-998-315-4817], c_acctbal: [2334.66], c_mktsegment: [AUTOMOBILE], c_comment: [c ideas are. accounts haggle ag ains]
.c_custkey: [53730], c_name: [Customer#000053730], c_address: [6fv7IW9Pr91QntCZzws11e2GXOxJj9A], c_nationkey: [24], c_phone: [34-998-302-6518], c_acctbal: [4923.4], c_mktsegment: [MACHINERY], c_comment: [silent requests haggle carefull y regular, regular packages. enticing, even deposits wake slyly among the]
.c_custkey: [12022], c_name: [Customer#000012022], c_address: [PwVDMfqZtKWOo], c_nationkey: [24], c_phone: [34-998-408-4382], c_acctbal: [2877.36], c_mktsegment: [HOUSEHOLD], c_comment: [layers. regular pinto beans about the quickly regu lar ideas cajole blithely]
.c_custkey: [125210], c_name: [Customer#000125210], c_address: [8JlJAg79TvSTdxgPebG3sUqKaOVv], c_nationkey: [24], c_phone: [34-998-711-2597], c_acctbal: [6678.32], c_mktsegment: [FURNITURE], c_comment: [ly ironic, ironic accounts. theoda lites among the slyly even patterns nag slyly fluffi]
.c_custkey: [50667], c_name: [Customer#000050667], c_address: [9aGxwCYLcG6y2eA], c_nationkey: [24], c_phone: [34-999-115-2195], c_acctbal: [8764.52], c_mktsegment: [FURNITURE], c_comment: [mptotes around the slyly bold instructions boost furi]
.c_custkey: [7208], c_name: [Customer#000007208], c_address: [,dZCqJe94SqXQjxAd7WxRMYyFVKGd4pFIrAshk], c_nationkey: [24], c_phone: [34-999-121-7718], c_acctbal: [82.07], c_mktsegment: [HOUSEHOLD], c_comment: [ns sublate furiously. carefu lly ironic platelets grow furiously. ironic, bold theodolites hang above th]
.c_custkey: [94642], c_name: [Customer#000094642], c_address: [MJerprOnUYRk], c_nationkey: [24], c_phone: [34-999-195-7029], c_acctbal: [6912.63], c_mktsegment: [BUILDING], c_comment: [totes above the pending, regular hockey players slee blithely after the blithely even deposits. carefully regula]
.c_custkey: [148611], c_name: [Customer#000148611], c_address: [HoNKKAELd2vMNyGWpw3ZZg5NaDs7FOdNIH64], c_nationkey: [24], c_phone: [34-999-283-6448], c_acctbal: [24.12], c_mktsegment: [HOUSEHOLD], c_comment: [requests above the blithely pending asymptotes sleep carefully about the slyly even excu]
.c_custkey: [102609], c_name: [Customer#000102609], c_address: [uPFXngvSOaDQIL], c_nationkey: [24], c_phone: [34-999-363-7145], c_acctbal: [6256.97], c_mktsegment: [AUTOMOBILE], c_comment: [ly regular asymptotes haggle fluffily according to the furiously bold courts. daring]
.c_custkey: [35470], c_name: [Customer#000035470], c_address: [Ot5zcyI1LhzXXLvXAY2FeToQIh,1ovs6zyA], c_nationkey: [24], c_phone: [34-999-379-6016], c_acctbal: [6097.18], c_mktsegment: [MACHINERY], c_comment: [lthout the fluffily ironic p ackages. daring, even de]
.c_custkey: [103505], c_name: [Customer#000103505], c_address: [XPNXpdCD7HRqcV0ABpjF3lxDc9A6X ZB2], c_nationkey: [24], c_phone: [34-999-404-9770], c_acctbal: [582.88], c_mktsegment: [FURNITURE], c_comment: [fully even deposits boost. qu ickly ironic requests could have to are according to the final accounts. final]
.c_custkey: [62707], c_name: [Customer#000062707], c_address: [DRbtSTIXhh], c_nationkey: [24], c_phone: [34-999-473-9448], c_acctbal: [7429.32], c_mktsegment: [FURNITURE], c_comment: [zzle slyly after the slyly ironic pinto beans. bold, fina]
.c_custkey: [41774], c_name: [Customer#000041774], c_address: [DpHfJFKVkr4LQelf9t5SSKzDUa4G3asKeya5M7dz], c_nationkey: [24], c_phone: [34-999-535-1203], c_acctbal: [7118.29], c_mktsegment: [FURNITURE], c_comment: [c requests sleep. quick ly silent requests wake fluffily. furiously close packages nag furiously across the caref]
.c_custkey: [94308], c_name: [Customer#000094308], c_address: [5aE9PLelngeVg8v6KCgOyR,NhDT5uC4], c_nationkey: [24], c_phone: [34-999-618-6653], c_acctbal: [8636.13], c_mktsegment: [FURNITURE], c_comment: [g, even deposits. carefully unus]
.c_custkey: [102414], c_name: [Customer#000102414], c_address: [Xzg9e1WbsX1QW,LUCyUAcPoOENdLUQt], c_nationkey: [24], c_phone: [34-999-618-6081], c_acctbal: [9614.62], c_mktsegment: [MACHINERY], c_comment: [usly final packages. carefully even packages by the permanently special gifts ne]
scanned 150000 recs

TestCase 5:

3

3

(c_phone>'34-999-195-7029') AND (c_mktsegment='FURNITURE')

Output:


```
n1kh1l@DESKTOP-G3LL7I1:/mnt/c/Users/Dhanjay/Desktop/Project2_part2$ ./test.out

** IMPORTANT: MAKE SURE THE INFORMATION BELOW IS CORRECT **
catalog location:      catalog
tpch files dir:
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
        3

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

(c_phone>'34-999-195-7029') AND (c_mktsegment='FURNITURE')
        c_custkey: [103505], c_name: [Customer#000103505], c_address: [XPNXpdCD7HRqcV0ABpJF31xDc9A6X ZB2 ], c_nationkey: [24], c_phone: [34-999-404-9770], c_acctbal: [582.88], c_mktsegment: [FURNITURE], c_comment: [fully even deposits bo
ost. quickly ironic requests could have to are according to the final accounts. final]
c_custkey: [62707], c_name: [Customer#000062707], c_address: [hRbtSTIXhh], c_nationkey: [24], c_phone: [34-999-473-9448], c_acctbal: [7429.32], c_mktsegment: [FURNITURE], c_comment: [zzle slyly after the slyly ironic pinto beans. bold, f
ina]
c_custkey: [41774], c_name: [Customer#000041774], c_address: [DpHF3FKVkr4LQe1f9t5S5KzDUa4G3asKeya5M7dz], c_nationkey: [24], c_phone: [34-999-535-1203], c_acctbal: [7118.29], c_mktsegment: [FURNITURE], c_comment: [c requests sleep. quickl
y silent requests wake fluffily. furiously close packages nag furiously across the caref]
c_custkey: [94308], c_name: [Customer#000094308], c_address: [5aE9PLeIngeVgBv6KCgOyR,NhDT5uC4], c_nationkey: [24], c_phone: [34-999-618-6653], c_acctbal: [8636.13], c_mktsegment: [FURNITURE], c_comment: [g, even deposits. carefully unus]

query over customer.bin returned 4 recs
```

GTEST:

There are four test cases among which 3 are for DBFile and one is for heap.

Output:

```
nikhil@DESKTOP-G3LL7I1:/mnt/c/Users/Dhanjay/Desktop/Project2_part2$ ./gTest.out
[==========] Running 4 tests from 2 test suites.
[----------] Global test environment set-up.
[----------] 3 tests from DBFile
[ RUN      ] DBFile.metaInfoToStr
[       OK ] DBFile.metaInfoToStr (0 ms)
[ RUN      ] DBFile.readMetaInfo
[       OK ] DBFile.readMetaInfo (11 ms)
[ RUN      ] DBFile.Open
[       OK ] DBFile.Open (28 ms)
[----------] 3 tests from DBFile (39 ms total)

[----------] 1 test from Heap
[ RUN      ] Heap.Create
[       OK ] Heap.Create (24 ms)
[----------] 1 test from Heap (24 ms total)

[----------] Global test environment tear-down
[==========] 4 tests from 2 test suites ran. (63 ms total)
[  PASSED  ] 4 tests.
```

SHELL SCRIPT:

After running the shell script, the output for all the test cases is stored in the file output1.txt.

Output:

3. customer

4. part

5. partsupp

6. supplier

7. orders

8. lineitem

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

(n_regionkey)

****

****

****

n_nationkey: [23], n_name: [UNITED KINGDOM], n_regionkey: [3], n_comment: [eans boost carefully special requests. accounts are. carefull]

n_nationkey: [11], n_name: [IRAQ], n_regionkey: [4], n_comment: [nic deposits boost atop the quickly final requests? quickly regula]

n_nationkey: [10], n_name: [IRAN], n_regionkey: [4], n_comment: [efully alongside of the slyly final dependencies.]

n_nationkey: [13], n_name: [JORDAN], n_regionkey: [4], n_comment: [ic deposits are blithely about the carefully regular pa]

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: [4], n_name: [EGYPT], n_regionkey: [4], n_comment: [y above the carefully unusual theodolites. final dugouts are quickly across the furiously regular d]

scanned 25 recs

```
********************************************************************
********************************************************************
******************************
```

3. customer
4. part
5. partsupp
6. supplier
7. orders
8. lineitem

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

```
********************************************************************
********************************************************************
******************************
```

c_custkey: [35478], c_name: [Customer#000035478], c_address:
[Ot5zcyiiLhzXXivX4Y2FeToQIh,iovs6zyA], c_nationkey: [24], c_phone:
[34-999-379-6016], c_acctbal: [6097.18], c_mktsegment: [MACHINERY], c_comment:
[ithout the fluffily ironic packages. daring, even de]
c_custkey: [103505], c_name: [Customer#000103505], c_address:
[XPNXpdCD7HRqcV8ABpjF3ixDc9A6X ZB2], c_nationkey: [24], c_phone:
[34-999-404-9770], c_acctbal: [582.88], c_mktsegment: [FURNITURE], c_comment: [fully
even deposits boost. quickly ironic requests could have to are according to the final accounts.
final]
c_custkey: [62707], c_name: [Customer#000062707], c_address: [bRbtSTIXhh],
c_nationkey: [24], c_phone: [34-999-473-9448], c_acctbal: [7429.32], c_mktsegment:
[FURNITURE], c_comment: [zzle slyly after the slyly ironic pinto beans. bold, fina]
c_custkey: [41774], c_name: [Customer#000041774], c_address:
[DpHfJFKVkr4LQeif9t5SSKzDUa4G3asKeya5M7dz], c_nationkey: [24], c_phone:
[34-999-535-1203], c_acctbal: [7118.29], c_mktsegment: [FURNITURE], c_comment: [c
requests sleep. quickly silent requests wake fluffily. furiously close packages nag furiously
across the caref]
c_custkey: [94308], c_name: [Customer#000094308], c_address:
[5aE9PLelngeVg8v6KCgOyR,NhDT5uC4], c_nationkey: [24], c_phone: [34-999-618-6653],

c_acctbal: [8636.13], c_mktsegment: [FURNITURE], c_comment: [g, even deposits. carefully unus]

c_custkey: [102414], c_name: [Customer#000102414], c_address: [Xzg9eiWbsxiQW,LUCyUAcPoOENdLUQt], c_nationkey: [24], c_phone: [34-999-618-6881], c_acctbal: [9614.62], c_mktsegment: [MACHINERY], c_comment: [usly final packages. carefully even packages by the permanently special gifts ne]

scanned 150000 recs

****
****
****

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

c_custkey: [103505], c_name: [Customer#000103505], c_address: [XPNXpdCD7HRqcV8ABpjF3ixDc9A6X ZB2], c_nationkey: [24], c_phone: [34-999-404-9770], c_acctbal: [582.88], c_mktsegment: [FURNITURE], c_comment: [fully even deposits boost. quickly ironic requests could have to are according to the final accounts. final]

c_custkey: [62707], c_name: [Customer#000062707], c_address: [bRbtSTIXhh], c_nationkey: [24], c_phone: [34-999-473-9448], c_acctbal: [7429.32], c_mktsegment: [FURNITURE], c_comment: [zzle slyly after the slyly ironic pinto beans. bold, fina]

c_custkey: [41774], c_name: [Customer#000041774], c_address: [DpHfJFKVkr4LQeif9t5SSKzDUa4G3asKeya5M7dz], c_nationkey: [24], c_phone: [34-999-535-1203], c_acctbal: [7118.29], c_mktsegment: [FURNITURE], c_comment: [c requests sleep. quickly silent requests wake fluffily. furiously close packages nag furiously across the caref]

c_custkey: [94308], c_name: [Customer#000094308], c_address: [5aE9PLelngeVg8v6KCgOyR,NhDT5uC4], c_nationkey: [24], c_phone: [34-999-618-6653], c_acctbal: [8636.13], c_mktsegment: [FURNITURE], c_comment: [g, even deposits. carefully unus]

query over customer.bin returned 4 recs

****
****
****

CONCLUSION

We have implemented the sorted file which is relatively advanced than the heap implementation for the database. In this part we extended the previous project and added all the methods which are required for the proper functioning of the database similar to heap implementation. We have successfully tested our project with necessary test cases and unit tests using gTest. We can further improve the performance by incorporating B+ trees for file systems.