

NAME: Jinesh Modi

ID: 1001622464

Programming Language Used: C# (.Net)

Transaction Table: HashMap (Dictionary / Key-Value pair) will be used to store records of this table**Schema:**

Column Name	Type	Possible values
tranID	Int	1-99
timestamp	DateTime	07/20/2018 06:30 PM
tranState	String	Active, Blocked, Aborted, Committed
lockedItems	List of Chars	A-Z
operationWaitlist	List of String	W2(X);

Lock Table: HashMap (Dictionary / Key-Value pair) will be used to store records of this table**Schema:**

Column Name	Type	Possible values
itemName	Char	A-Z
lockState	String	Read, Write, Unlock
tranIDs	List of Int	Can be single or multiple values of 1-99
waitTranIDs	List of Int	Can be single or multiple values of 1-99

Reading File:

```

line = readLine()
while (line != null)
    if (line starts with 'b')
        BeginTransaction(2nd char of line)
    else if (line starts with 'r')
        ReadLock(2nd char of line , X)
    else if (line starts with 'w')
        WriteLock(2nd char of line , X)
    else if (line starts with 'e')
        EndTransaction(2nd char of line)
    else print "Invalid Operation"

```

BeginTransaction (transactionID):

```

transactionID = transactionID
transactionState = "Active"
transactionTimeStamp = CurrentDateTime
Insert transaction record in Transaction table (HashMap)

```

ReadLock (transactionID , X):

```

If (Transaction.transactionID.state == "ACTIVE")
    if (Lock.X == NULL OR Lock.X.State == "UNLOCKED")
        Lock.X.State = "READ"
        Lock.X.TransactionIDs = transactionID
        Transaction.transactionID.ItemsLocked = Transaction.transactionID.ItemsLocked + 'X'
        Insert/Update record in Transaction table (HashMap)
        Insert/Update record in Lock table (HashMap)
    else if (Lock (X) == "READ" AND Lock.X.TransactionIDs != transactionID)
        Lock.X.TransactionIDs = Lock.X.TransactionIDs + transactionID
        Transaction.transactionID.ItemsLocked = Transaction.transactionID.ItemsLocked + 'X'
        Insert/Update record in Transaction table (HashMap)
        Insert/Update record in Lock table (HashMap)
    else if (Lock (X) == "WRITE" AND Lock.X.TransactionIDs != transactionID)
        CheckDeadLock(transactionID, X, ReadOperation)

```

NAME: Jinesh Modi

ID: 1001622464

```

else if (Transaction.transactionID.state == "BLOCKED")
    Transaction.transactionID.OPWaitList = Transaction.transactionID. OPWaitList + ReadOperation

```

WriteLock (transactionID , X):

```

If (Transaction.transactionID.state == "ACTIVE")
    if (Lock.X == NULL OR Lock.X.State == "UNLOCKED")
        Lock.X.State = "READ"
        Lock.X.TransactionIDs = transactionID
        Transaction.transactionID.ItemsLocked = Transaction.transactionID.ItemsLocked + 'X'
        Insert/Update record in Transaction table (HashMap)
        Insert/Update record in Lock table (HashMap)
    else if (Lock (X) == "READ" AND Lock.X.TransactionIDs == transactionID) // This transaction only
        Lock.X.State = "WRITE"
        Insert/Update record in Lock table (HashMap)
    else if ((Lock (X) == "READ" OR Lock (X) == "WRITE") AND Lock.X.TransactionIDs != transactionID)
        CheckDeadLock(transactionID, X, WriteOperation)
else if (Transaction.transactionID.state == "BLOCKED")
    Transaction.transactionID.OPWaitList = Transaction.transactionID. OPWaitList + WriteOperation

```

EndTransaction (transactionID):

```

If (Transaction.transactionID.state == "ACTIVE")
    Commit (transactionID)
else if (Transaction.transactionID.state == "BLOCKED")
    Transaction.transactionID.OPWaitList = Transaction.transactionID. OPWaitList + EndOP

```

UnLock (transactionID):

```

Transaction.transactionID.ItemsLocked = NULL
// Remove transactionID from Lock.AllItems
Lock.X.State = "UNLOCK"
// Remove 1st TransactionID from Lock.X.WaitListTran and change it's Transaction.State = "ACTIVE" and
perform it's waiting operations

```

CheckDeadLock (transactionID, X, pendingOperation): // According to Wait-Die Protocol

```

currentTransaction = Lock.X.TransactionIDs
while (currentTransaction)
    if (Transaction.transactionID.TimeStamp < Transaction. currentTransaction.TimeStamp)
        Transaction.transactionID.Status = "BLOCKED"
        Transaction.transactionID.WaitListTran = Transaction.transactionID.WaitListTran +
        pendingOperation
    else Abort (transactionID)

```

Commit (transactionID):

```

Transaction.transactionID.state == "COMMITTED"
UnLock(transactionID)

```

Abort (transactionID):

```

Transaction.transactionID.state == "ABORTED"
UnLock(transactionID)

```