unit - 4 (Transaction Management)

Locking protocol:

> It is responsible to prevent a Transaction from reading or writing data until the necessary lock is obtained.

> Types of Locking protocol:

    i) simple Lock Based protocol

    ii) two phase locking "

1. Simple Lock Based Protocol:

> It is a mechanism in which we use locks on the data item for current transaction.

> Types:

    i) shared lock

    ii) Exclusive lock.

Shared Lock:

> It is used for reading data items only.

> It is denoted by Lock -S

> this is also called as read - lock

Exclusive Lock:

> It is used for both read & write operations.

> It is denoted as Lock - x.

> this is also called as write lock.

- Matrix Represents the compatibility between modes of locks:

	S	X
S	T	F
X	F	F

Example:

T1

Exclusive Lock.
- Lock-X(A).

  R(A)

  A = A - 50
  W(A)

  unlock (A).

T2.

Lock-S(A)
R(A)
unlock (A). } → shared lock

Two-Phase locking Techniques :

> It is a protocol in which there are two phases.

> i) Growing phase
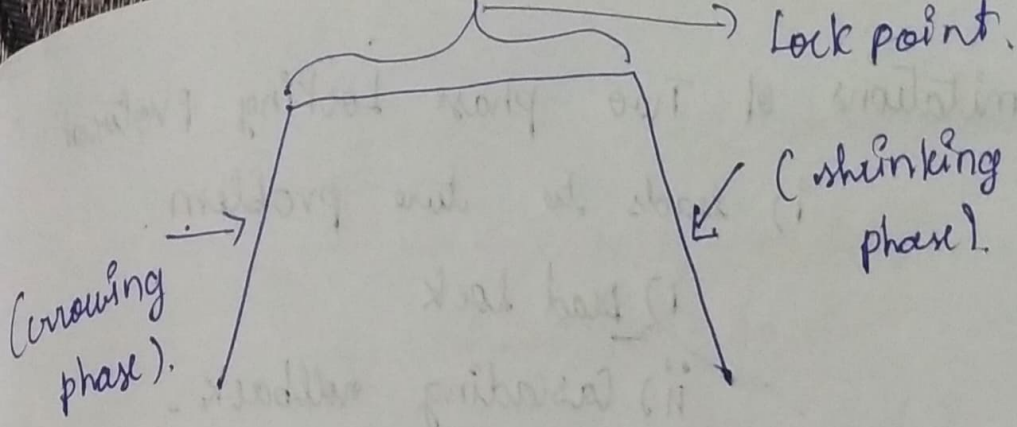   ii) Shrinking phase.

Growing phase :

> It is a phase in which the transaction may obtain locks but does not release any lock.

Shrinking phase :

> It is a phase in which the transaction may release the lock but does not obtain any new lock.

Lock point :

The last lock position or first unlock position is called lock point.

Lock point.

(Growing phase). →

← (shrinking phase).

Example:

T1	T2
Lock-S(A)	Lock -S(A).
Lock-X(B).	
unLock (A).	Lock -X(C).
unlock (B).	unlock (A).
	unlock (C).

(or)

Eg in book pg -(4-33.).

Limitations of Two phase Locking Protocol

i) leads to two problem.

    i) Dead lock

    ii) Cascading rollback.

Dead lock:

can not be solved by 2-phase locking.

T1	T2
Lock-x(A)	Lock-x(B)
Read (A)	Read (B).
A = A-50	B = B+100
write (A)	Write (B)
Delayed, wait for T2 to release Lock on B.	Delayed, wait for T1 to release lock on A.

Cascading Rollback: → single transaction failure.

T1	T2	T3.
Read (A)		
Read (B).		
C = A+B.		
Write C.		
	Read (c)	
	Write (C).	
		Read (C).

Types of Two phase Locking:

i) strict Two phase locking:

The exclusive locks are unlocked only after the transaction is committed.

Eg:

T_1	T_2
W(A)	
	R(A).

Locks apply:

T_1	T_2
Lock-x(A).	
W(A)	
commit	
unlock (A).	
	Lock-s(A)
	R(A)
	unlock-s(A)

ii) Rigorous Two phase locking:

Here all the locks are to be held untill the Transaction commits.

Eg:

T_1
R(A)
R(B)
R(C).

$\longrightarrow$ Apply lock.

T_1
Lock-s(A).
R(A)
Lock-x(B).
R(B)
W(B).
commit
unlock (A)
unlock (B)

Lock conversion:

> It is a mechanism in two phase locking mechanism.

> It allows to conversion of shared lock to exclusive lock (or) exclusive lock to shared lock.

> Method of conversion:

First phase:

> Acquire lock-s on item
" lock-x on item

> lock-s to lock-x (upgrade)

Second phase:

> Can release lock-s
" " lock-x.

> lock-x to lock-s (down grade)