

(a) what are the transaction boundaries

Answer 1

Transaction boundaries are where a transaction begins or ends, where within the transaction all writes to the database are atomic, in that they either all complete or all are denied if any single write in a given transaction fails.

(b)

why concurrency control is required?

(Answer b)

concurrency control is needed to coordinate concurrent access to DBMS so that the overall correctness of the database is maintained.

It is also required to increase time efficiency

For example -

If we take ATM machine and do not use concurrency, multiple persons cannot draw money at a time in different places.

(c)

Explain with example order by and group by functions.

Group by statement is used to group the rows that have the same value.

Order by statement sort the result-set either in ascending or in descending order.

(d)

What is AFIM and BFIM?

Answer (d)

BFIM - Before Image - the old value of the data item before updating is called the before image.

AFIM - After Image - The new value of the data item after updating is called the after image.

(e)

What is Distributed Database systems?

A distributed database system is an integrated collection of databases that is physically distributed across sites in a network.

(Question - 2) $(2+2+4+2) = 10$

How derived attribute differ from non-derived attribute? Explain with example.

example →

Answer

For a specific person entity, the value

of Age can be determined from the

current date and the value of that person's Birth date therefore, the attribute age is known as derived attribute and the attribute Birth Date is known as non-derived or stored attribute.

non-Derived Attribute

stored attribute

- 1) An attribute that cannot be derived from other attributes.

- 2) It is not possible to determine the value of the attribute using another attribute.

- 3) ex: Date-of-Birth

Derived or
non-stored attribute

An attribute that can be obtained using another stored attribute.

- 2) It is possible here

Ex: age

~~QUESTION~~ question (Q) marks (6)

what are the advantages of ordered file over unordered file organization?

(Answer)

- 1) Reading of the record in order of the ordering field is extremely efficient
- 2) Finding the next record is fast
- 3) Finding records based on a query of the ordering field is efficient
(binary search)
- 4) Binary search may be done on the blocks as well.

(umarks)

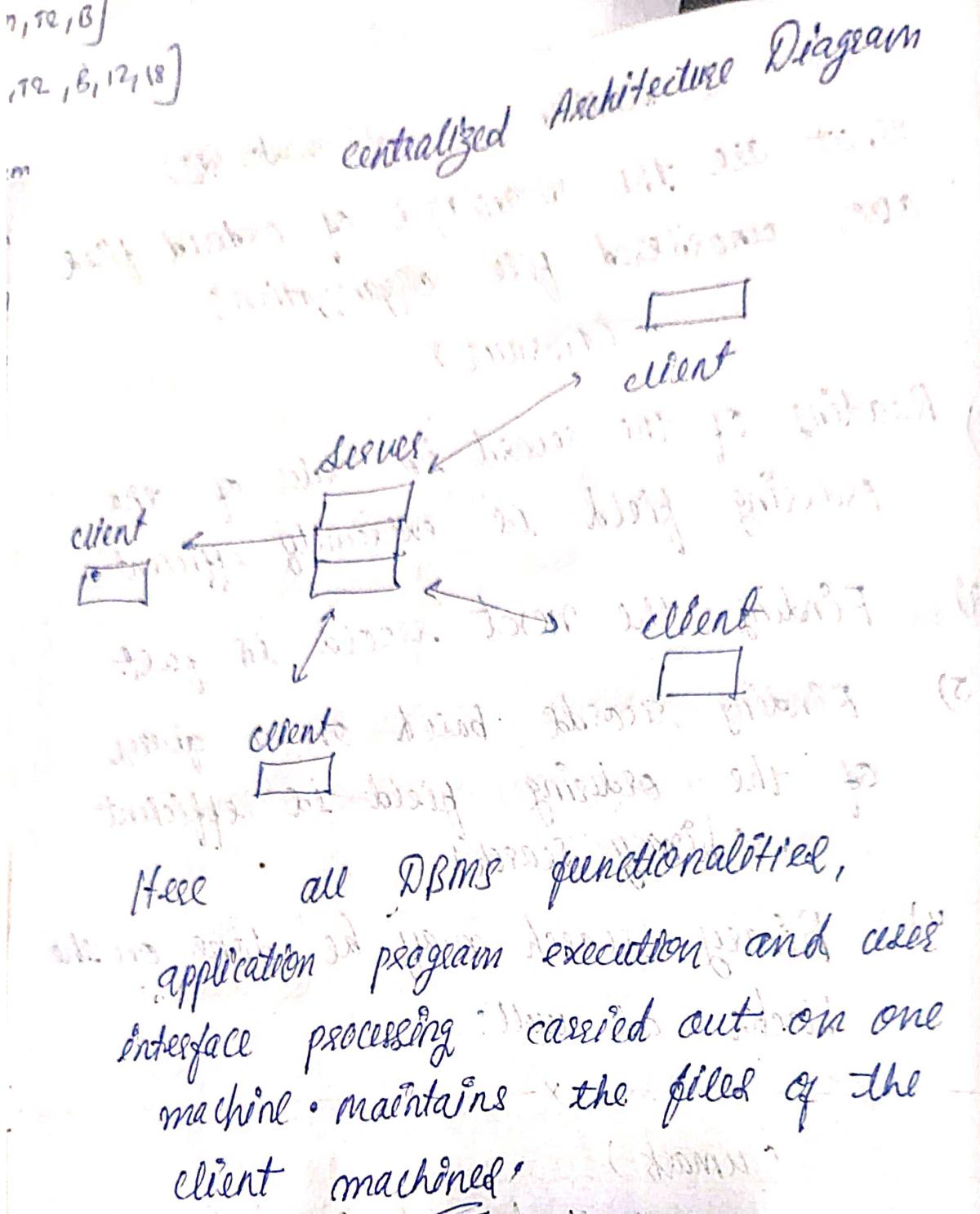
illustrate centralized and Client-Server Architectures

Centralized Architecture -

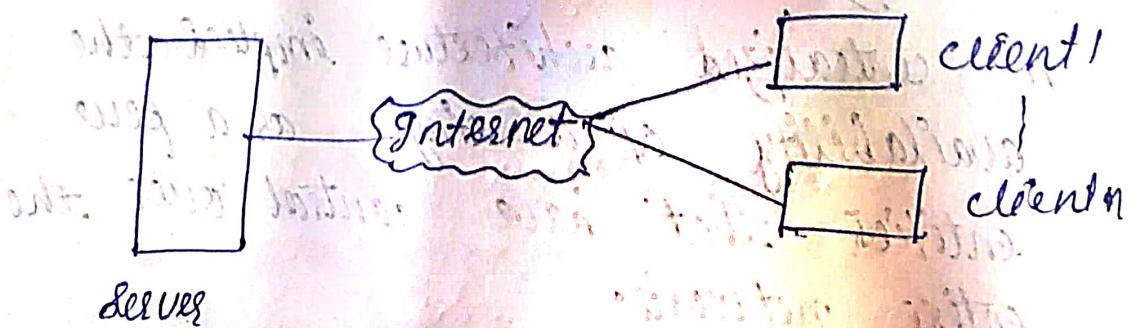
A centralized architecture implies the availability of a single or a few entities that have control over the entire network.

For example - Facebook, Google and government database architectures.

7, 12, B
12, B, 12/18]



Client - Server Architecture



The client - server architecture is a distributed architecture. In this architecture when client computer sends a request for data to the server through the Internet the server accepts the requested process and delivers the data package as packet requested back to the client.

client does not share any of their resources. Examples of this architecture are - World Wide Web, Email etc.

Question

Before a transaction reached its commit point, any portion of the log that has not been written to the disk yet must now be written to the disk. This process is called force-writing of the log, before committing a transaction.

• implemented on older machines

• bottleneck for us, full

• standard transaction interface - standard

Q. 3. (Question - 3)

why recovery is required? Explain different types of transaction failure.

Ans 3 (a)

Recovery protects the database and associated data from unnecessary problems and avoid or reduce the possibility of having to duplicate work manually.

Transaction Failures

1) A computer failure - A hardware or software can crash during transaction execution so the content of computer's memory can lost. That's why recovery is needed.

2) A transaction or system error :-

Some operations may cause it to fail, such as integer overflow or divide by zero. In addition the user may interrupt the transaction.

3) local errors or exception condition -

Certain conditions which are demanded but are not fulfilled.

example - insufficient account balance.

concurrency control enforcement -

the concurrency method may decide to abort the transaction, to be restarted later, because it violates serializability or because several transactions are in a state of deadlock.

Disk failure - Some disk blocks may lose their data because of a read or write malfunction or because of a disk read/write head crash. This may happen during a read or a write operation of the transaction.

3 question (b)

How BCNF differ from 3NF?

3NF	BCNF
1) It concentrates on prime key	It concentrates on all candidate keys
2) Redundancy is high compared to BCNF	Redundancy is low compared to 3NF
3) It may preserve all dependencies	It may not preserve all functional dependencies
4) No transitive dependency	5) 1NF side must have a key attribute attribute

3rd question (c)

Differentiate between partial dependency and transitive dependency?

Transitive dependency occurred when some non key attribute determined some other attribute.

Partial dependency occurred when one primary key determined some other attributes. (In composite key)

Question (d)

How WAL protocol helps in recovery process?

In computer science, write ahead logging (WAL) is a family of techniques for providing atomicity and durability in database system which helps in recovery process.

working - The changes are first recorded in the log which must be written physically to stable storage before the changes are written to the database.

what are the desired properties of transaction.

(+) There are four desired properties of transaction.

1) Atomicity - A transaction is an atomic unit of processing, it is either performed or is not either it's not performed at all.

2) Consistency - It maintains the integrity constraints so that the database is consistent before and after the transaction. means the execution of a transaction will leave a database in either its prior stable state or a new stable state. It helps the transaction to transform the database from one consistent state to another consistent state.

3) Isolation - It shows that data which is added at the time of execution of a transaction cannot be used by the second transaction until first one is completed.

The concurrency control subsystem of the DBMS enforces the isolation property.

Durability -

The durability property is used to indicate the performance of the database's consistent state; this state cannot be lost, even in the event of a system's failure.

In short - This property ensured that once the transaction had completed execution,

Question

How are the 4 transaction moves through its execution stated? illustrate with a suitable diagram:



Transaction states

- 1) Active - It is the initial process of entering a transaction, the transaction remains in this state while it is executing read, write or other operations.
- 2) Partially committed - The transaction entered in this state after the last statement of the transaction has been executed.
- 3) committed - The transaction enters in this state after successful completion of the transaction and system issues a commit signal.
- 4) Failed - The transaction goes from partially committed state or active state to failed state when it's discovered that normal execution can no longer proceed or system checked fail.
- 5) Aborted - This is the state after the transaction had been rolled back after failure and database is now in its previous stage.

what is the role of
checkpoint in database
recovery?

checkpoint is a mechanism where all
the previous logs are removed from
the system and stored permanently
in a storage disk.

checkpoint declared a point before which
the DBMS was in consistent
state and all the transactions
were committed.

A checkpoints is used for recovery if
there is an unexpected shutdown
in the database.

(Question)

Explain Dirty read problem with
example?

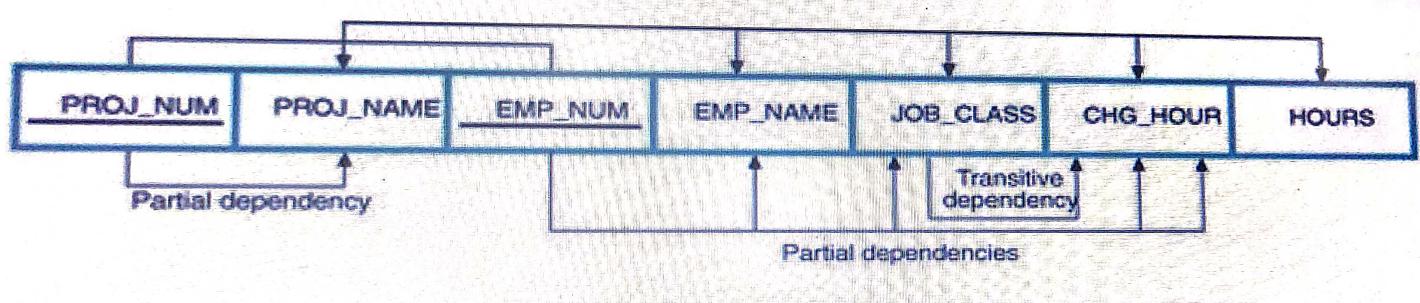
(Answer)

Dirty read occurred when a transaction
reads data that had not yet been
committed.

example - Suppose transaction 1 updated
a row. Transaction 2 reads the updated
row before transaction 1 commits the update

- [start_transaction, T3]
- [read_item, T3, C]
- [write_item, T3, B, 15, 12]
- [start_transaction, T2]
- [read_item, T2, B]
- [write_item, T2, B, 12, 18]
- [start_transaction, T1]
- [read_item, T3, A]
- [read_item, T3, D]
- [write_item, T1, D, 20, 25]

Sl	T_ID	BackP	NextP	Operation	Data Item	BFIM	AFIM
1	T3	0	2	B			
2	T3	1	3	R	C	50	50
3	T3	2	8	W	B	15	12
4	T2	0	5	B			
5	T2	4	6	R	B	12	12
6	T2	5	11	W	B	12	18
7	T1	0	10	B			
8	T3	3	9	R	A	40	40
9	T3	8	13	R	D	20	20
10	T1	7	12	W	D	20	25



Second Normal Form (2 NF)

- **Conversion to Second Normal Form**
 - Starting with the 1NF format, the database can be converted into the 2NF format by
 - Writing each key component on a separate line, and then writing the original key on the last line and
 - Writing the dependent attributes after each new key.

PROJECT (PROJ_NUM, PROJ_NAME)

EMPLOYEE (EMP_NUM, EMP_NAME, JOB_CLASS, CHG_HOUR)

ASSIGN (PROJ_NUM, EMP_NUM, HOURS)

Dependency Diagram

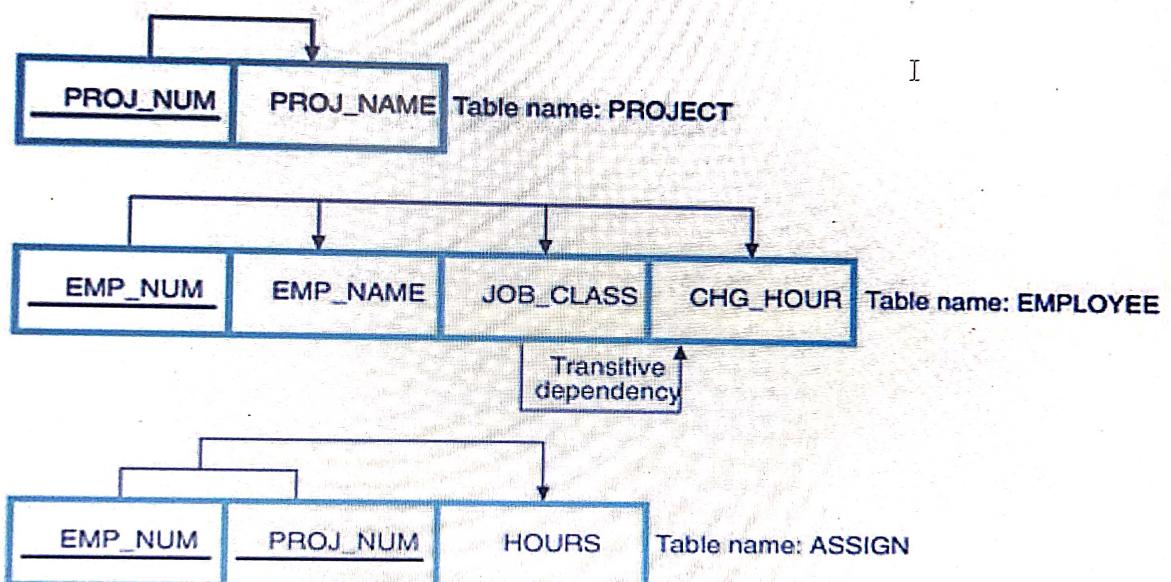


FIGURE 5.5 SECOND NORMAL FORM (2NF) CONVERSION RESULTS

Third Normal Form (3 NF)

- Conversion to Third Normal Form
 - Create a separate table with attributes in a transitive functional dependence relationship.

PROJECT (PROJ_NUM, PROJ_NAME)

ASSIGN (PROJ_NUM, EMP_NUM, HOURS)

EMPLOYEE (EMP_NUM, EMP_NAME, JOB_CLASS)

JOB (JOB_CLASS, CHG_HOUR)