1)      Using empname as a clustered index is possible only when everyone employee will have a unique name. If this is ensured, the tupus will be organized according empname alphabetically.

Using empid as a clustered index is definitely possible considering everyone already has a unique i'd assigned to them. The tuples will be organized accordingly to empid.

Using both empname and empid as a clustered indexces may not be possible but it is possible two have one clustered index and one non-clustered index.

2). DDL is important in Representing information in DBMS because it is used to describe External and Logical schemes.

. DML is used to Modify and Manipulate data, it is not important for Representing the data.

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3) True,

A DBMS is typically shared among many users.

Transactions from these users can be interleaved to improve the execution time of user's queries. By interleaving queries, users do not have to wait for other user's transactions to complete fully before their own transaction begins. Without interleaving, if user A begins a transaction that will take 10 sec to complete, and user B wants to begin a transaction, user B would have to wait an additional 10 sec for user A's transaction to complete before the database would begin processing user B's request.

4) a) A user must guarantee that his or her transaction does not corrupt data or insert nonsense in the database. For example, in a banking database, a user must guarantee that a cash withdraw transaction accurately models the amount a person removes from his or her account. A database application would be worthless if a person removed 20 dollars from an ATM but the transaction set their balance to zero.

b) A DBMS must guarantee that transactions are executed fully and independently of other transactions. An essential property of a DBMS is that a transaction should execute automatically or as if it is the only transaction running. Also, transactions will either complete fully, or will be aborted and the database returned to it's initial state. This ensures that the database remains consistent.

5) Yes, we can determine the key of relation with the help of instance. eg:- In a one to many relation we can consider the column / attribute with unique values as a primary key.

7) $P(R_1, \text{Catalog})$
   $P(R_2, \text{Catalog})$

$\Pi_{R_1.Pid} \sigma_{R_1.Pid = R_2.Pid \wedge R_1.Sid! = R_2.Sid} (R_1 \times R_2)$

using the following:

| SID | PID | Cost |
|-----|-----|--------|
| 1 | 1 | $10.00 |
| 2 | 1 | $9.00 |
| 2 | 3 | $34.00 |
| 3 | 1 | $11.00 |

$\sigma_{R_1.Pid = R_2.Pid}$ gives us:

| SID | PID | Cost | SID | PID | Cost |
|-----|-----|--------|-----|-----|-------|
| 1 | 1 | $10.00 | 1 | 1 | 10.00 |
| 1 | 1 | 10.00 | 2 | 1 | 9 |
| 1 | 1 | 10.00 | 3 | 1 | 11 |
| 2 | 1 | 9.00 | 1 | 1 | 10 |
| 2 | 1 | 9 | 2 | 1 | 9 |
| 2 | 1 | 9 | 3 | 1 | 11 |
| 2 | 3 | 34 | 2 | 3 | 34 |
| 3 | 1 | 11 | 1 | 1 | 10 |
| 3 | 1 | 11 | 2 | 1 | 9 |
| 3 | 1 | 11 | 3 | 1 | 11 |

R₁ × R₂ gives us:

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| SID | PID | Cost | SID | PID | Cost |
|-----|-----|------|-----|-----|------|
| 1 | 1 | 10 | 1 | 1 | 10 |
| 1 | 1 | 10 | 2 | 1 | 9 |
| 1 | 1 | 10 | 2 | 3 | 34 |
| 1 | 1 | 10 | 3 | 1 | 11 |
| 2 | 1 | 9 | 1 | 1 | 10 |
| 2 | 1 | 9 | 2 | 1 | 9 |
| 2 | 1 | 9 | 2 | 3 | 34 |
| 2 | 1 | 9 | 3 | 1 | 11 |
| 2 | 3 | 34 | 1 | 1 | 10 |
| 2 | 3 | 34 | 2 | 1 | 9 |
| 2 | 3 | 34 | 2 | 3 | 34 |
| 2 | 3 | 34 | 3 | 1 | 11 |
| 3 | 1 | 11 | 1 | 1 | 10 |
| 3 | 1 | 11 | 2 | 1 | 9 |
| 3 | 1 | 11 | 2 | 3 | 34 |
| 3 | 1 | 11 | 3 | 1 | 11 |

$\sigma_{R_1.Pid = R_2.Pid \wedge R_1.Sid\ != R_2.Sid}$ gives us:

| SID | PID | Cost | SID | PID | Cost |
|-----|-----|------|-----|-----|------|
| 1 | 1 | 10 | 2 | 1 | 9 |
| 1 | 1 | 10 | 3 | 1 | 11 |
| 2 | 1 | 9 | 1 | 1 | 10 |
| 2 | 1 | 9 | 3 | 1 | 11 |
| 3 | 1 | 11 | 1 | 1 | 10 |
| 3 | 1 | 11 | 2 | 1 | 9 |

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8) Invalid query.

Explanation:- This relational algebra statement does not return anything because of the sequence of projection operators. Once the rid is projected, it is the only field in the set. Therefore, projecting on same will not return anything.

$\Pi$sname ($\Pi$sid (($\sigma$ color = Ored0 (Parts)) * ($\sigma$ cost < 100 (catalog)) * Suppliers))):

Invalid query.

9)

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The following view on Emp can be updated automatically by updating Emp:

CREATE VIEW SeniorEmp (eid, name, age, salary)

AS SELECT E.eid, E.ename, E.age, E.salary

From Emp E

WHERE E.age > 50

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