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SET-B

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(B1) Given f.d : R(A, B, C, D, E, F, G)

AB → CD, AF → D, DE → F, C → G, F → E, G → A

$(ABCDEFG)^+ = \{ABCDEFG\}^+$.

From AB → CD

$(ABEFG)^+ = \{ABCDEFG\}^+$

∵ AB → DE , DE → F

$(ABEG)^+ = \{ABCDEFG\}$.

~~AB → D, DE →~~ AB → C, C → G, ~~G~~

$(ABE)^+ = \{ABCDEFG\}$.

Any subset of (ABE)'s closure doesn't contain the entire set, therefore ABE is a candidate key.

Prime Attributes - {A, B, E}.
· candidate key = {ABE}

E is on RHS of F → E
∴ ~~ABE~~ (ABF)⁰ is also a candidate key

Now P.A = {A, B, E, F}
C.K = {ABE, ABF}

A on RHS of G → A. ∴ C.K = GBE, GBF.

P.K = {A, B, E, F, G}
C.K = {ABE, ABF, GBE, GBF}.

G is on RHS of C → G.

∴ P.K = {A, B, E, F, G, C}

C.K = {ABE, ABF, GBE, GBF, CBE, CBF}.

Finding closure of CF.

$(CF)^+ = \{C, F\}$.

Since C → G ⇒ $(CF)^+ = \{C, F, G\}$.

Since, F → E ⇒ $(CF)^+ = \{C, F, G, E\}$.

G → A ⇒ $(CF)^+ = \{C, F, G, E, A\}$

AF → D ⇒ $(CF)^+ = \{A, C, D, E, F, G\}$.

∴ $(CF)^+ = \{ACDEFG\}$ is true.

Finding closure of AE.

$(AE)^+ = \{A, E\}$.

∵ ~~Ad~~ F → E, ~~By Armstrong~~ Axiom,

AF → AE, and AF → D.

∴ $(AE)^+ = \{ACDEFG\}$ is false since

actually the closure of AE is only {A, E}.

Q1-(b) $R(A, B, C, D)$

F.D : $\{A \to B, A \to BC, C \to D\}$

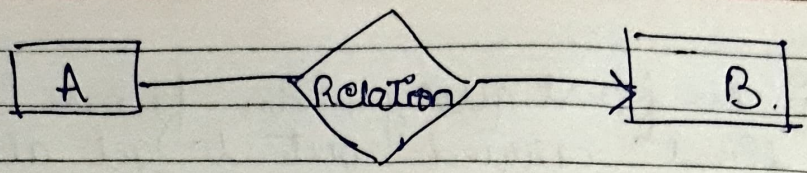
$A \to BC$ can be written as
$A \to B$, $A \to C$ (By decomposition).

∴ (i) $A \to C$ can be derived

(ii) $A \to C$ and $C \to D$
(By Axioms of Transitivity, $A \to D$)
∴ $B \to D$ can't be derived

(iii) $BC \to D$
Closure of BC:
$(BC)^+ = \{B, C\}$
$= \{B, C, D\}$ ∵ $C \to D$
∴ $BC \to D$ can be obtained.

Q1→C



Here, directed arrow shows 'one' and undirected arrow shows many i.e many to one participation cardinality is present.

A can relate with atmost one B and B can relate with 0 or several A.

Here, A→B, A→BC, A→D shows that A is the primary key and A uniquely determines B.
Therefore

A	B
1	2
1	2
2	3
3	3

Here for any tuple, if $A[x_1] = A[x_2]$ then $B[y_1] = B[y_2]$.
i.e for a given value of A, B should have same value.
But, for the same value of B, A can have different values as shown above.
B=3, but A=2 and B=3 but A=3.
Therefore, there is many to one relation present.

Q3 (a) Vehicle (Vno, Vmake, Vtype, Vprice) 087

Driver (Dno, License, Year, Experience, State)

Drives (Dno, VNO, Date, Start Time, End Time)

Vno will be the primary key of the relation since it can uniquely determine all the tuples in the relation. (Vno, Vmake) is not a minimal key since Vno alone can identify the tuples since we know which number is also used in relationship set 'Drives' as a foreign key. (No extraneous attribute in VNO).

(i)
```
select *
from Vehicle
where Vprice > 200,000
order by Vmake asc;
```

Shows the tuple in 'Vehicle' table sorted in ascending order according to Vmake and whose price is greater than 2 Lakh.

(ii)
```
Select Experience
from Driver, Drives
where Driver.Dno = Drives.Dno
and Vno = 'DL2C4715'
```

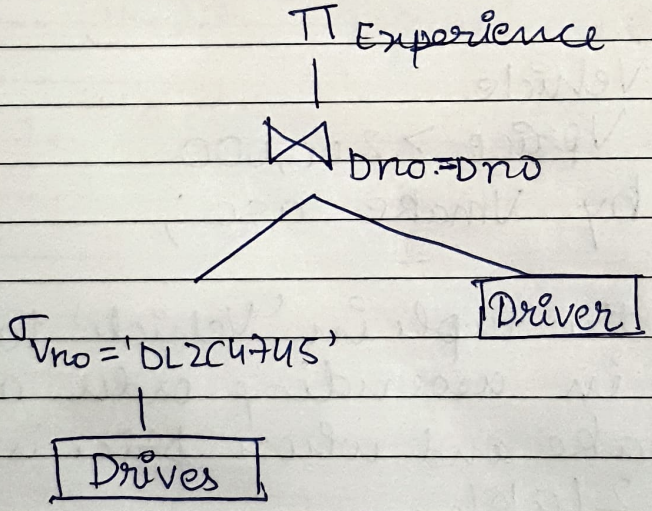
This will show the experience of driver with ~~licence~~ vehicle no = DL2C4715.

(i) Query Tree is an internal representation of an SQL statement

Relational Algebra query : $\sigma_{Vprice > 2,00,000}(Vehicle)$

Order By Vmake
$\sigma_{Vprice > 2,00,000}$
Vehicle

(ii) $\pi_{Experience}(\sigma_{Driver.Dno = Drives.Dno \wedge Vno = 'DL2C4745'}(Driver \times Drives))$



→ select operation is done before the join operation in order to reduce the number of tuples available for join.

→ most restrictive select operation has been performed at first

(b)(ii) In first query, the from clause is first carried out to get all the tuples. Next the WHERE clause is implemented and the constraints are applied to the rows. The rows that satisfy the constraint are then selected, from SELECT clause and then ORDER BY is executed and sorted according to specified criteria.

→ The internal node of query tree are first implemented. The execution terminates when the root is executed and the result of query is produced.

Similarly the execution in second query, the JOIN operation is carried out, with the rows displayed which satisfy the criteria mentioned and then the select operation is carried out.