AHSANULLAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

Department: Computer Science and Engineering (CSE)

Program: B.Sc. in Computer Science and Engineering

ASSIGNMENT

Course No	**:** CSE 4125
Course Title	**:** Distributed Database Systems
Year / Semester	**:** 4 / 1
Session	**:** Fall 2021
Date of Submission	**:** 10/09/2022
ID	**:** 180204142

Ans. to the Q.No. 1

(i)

Query : $(((\sigma_{SAL>25K}\ EMP\ \bowtie_{ID=ID}\ DEPT)\ \mathbb{F}\ (\sigma_{AGE\leq 25}\ EMP\ \bowtie_{ID=ID}\ DEPT))\ \bar{\bowtie}\ (EMP\ \bowtie_{ID=ID}\ DEPT))\ \mathbb{F}\ (\sigma_{SAL>25K\ AND\ AGE>25}\ EMP\ \bowtie_{ID=ID}\ DEPT)$

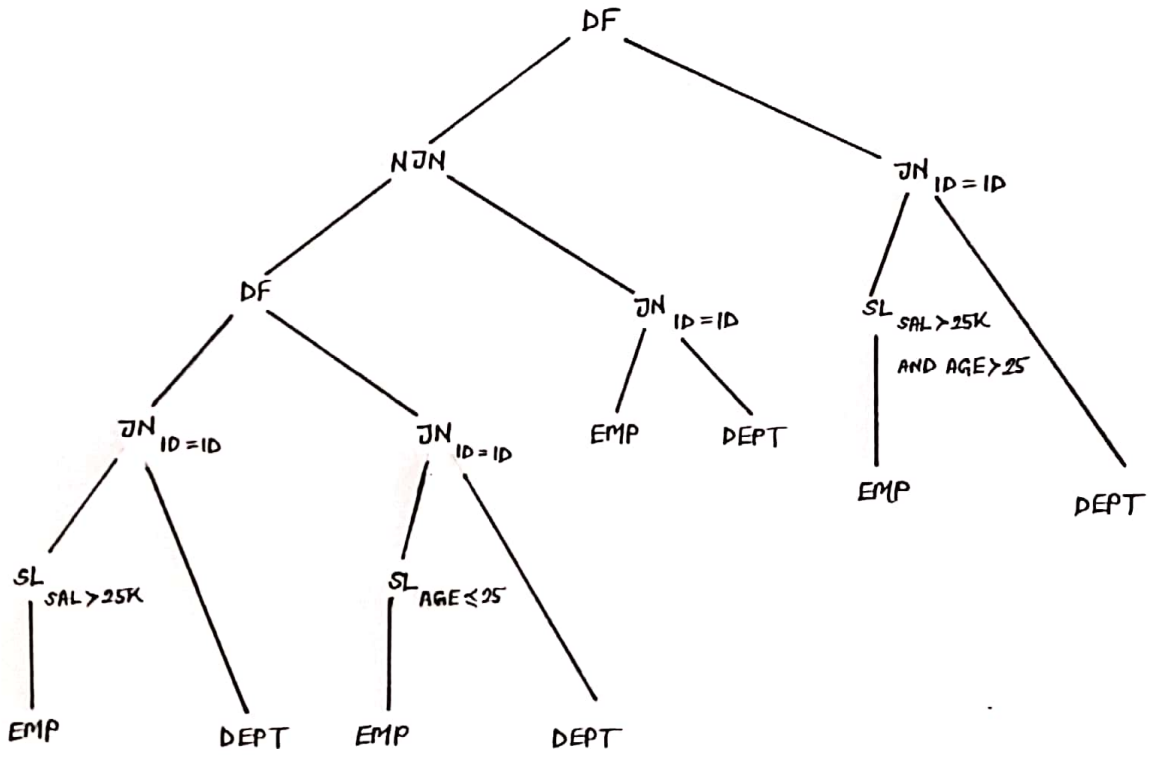
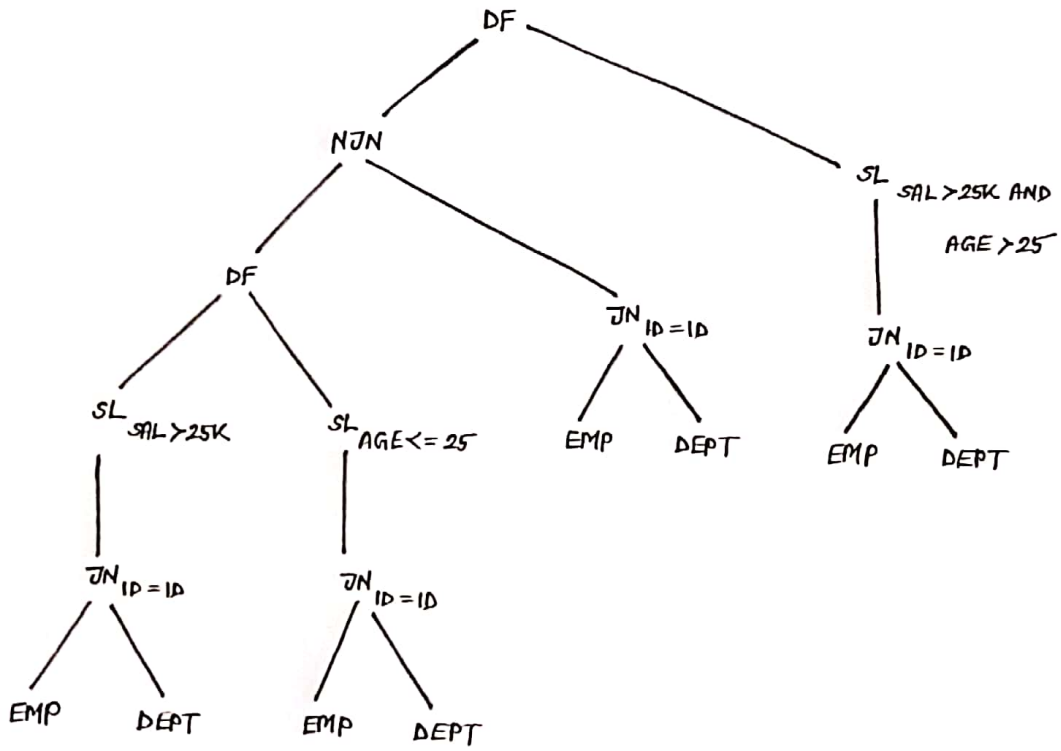


Figure : Operator Tree

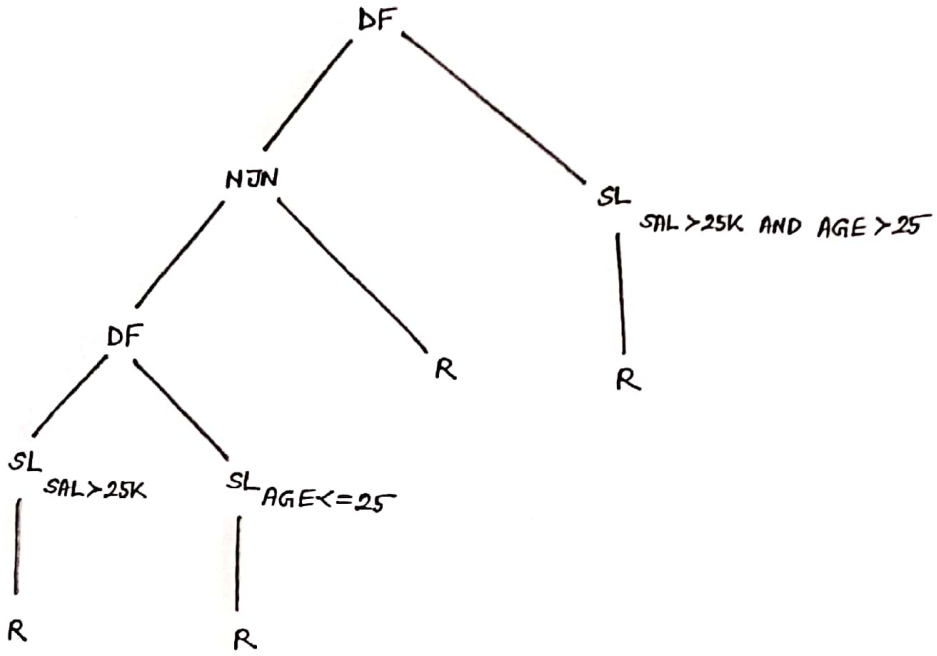
(ii)

Perform step by step transformations to simplify the operator tree, indicating which rule and criterion is applied at each step.

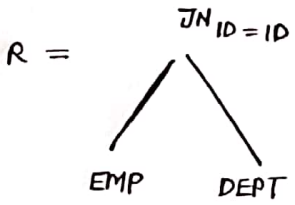
Answer:

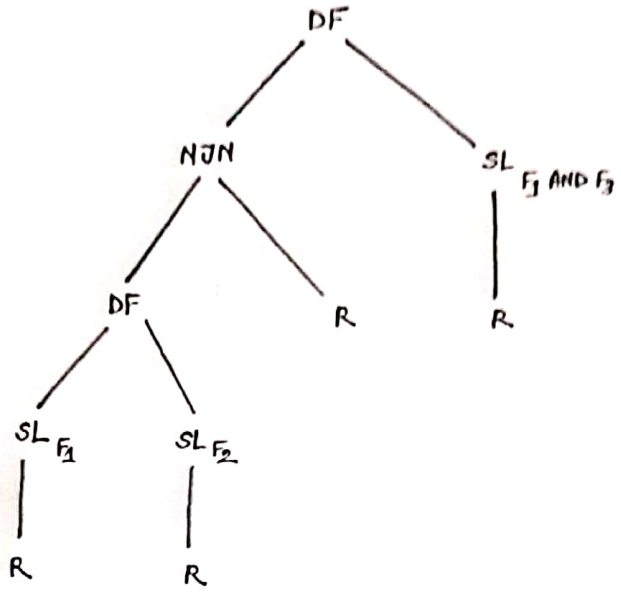


Finding common subexpression :



Here,





Here,

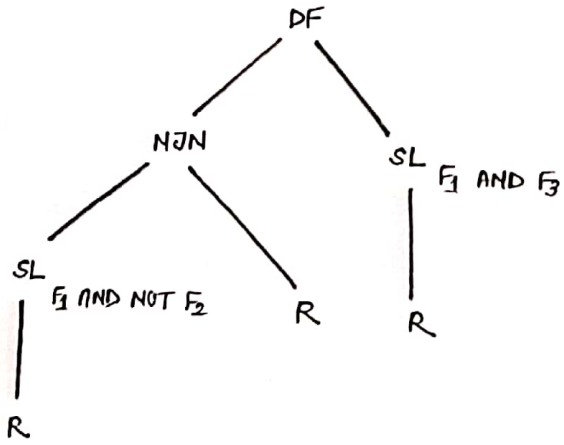
F_1 : SAL > 25K

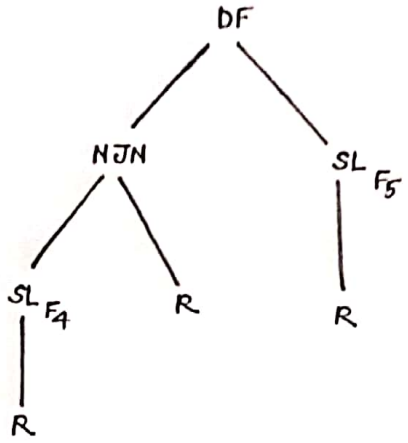
F_2 : AGE <= 25

F_3 : AGE > 25

We can write it as : $(SL_{F_1} R)\ DF\ (SL_{F_2} R) \Leftrightarrow SL_{F_1 \text{ AND NOT } F_2} R$

(Rule → 9)





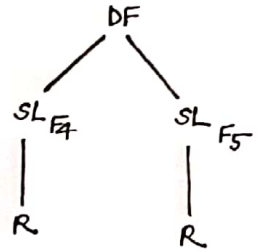
Here,

F_4 : F_3 AND NOT F_2

F_5 : F_1 AND F_3

We can write it as: $SL_{F4}\,R \Leftrightarrow R$ NJN $SL_F\,R$

(Rule → 4)

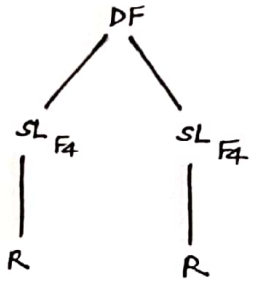


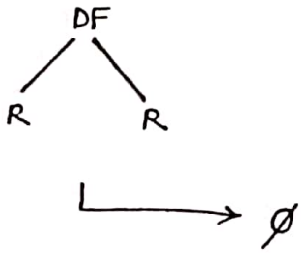
Here,

F_3 : NOT F_2

F_4 : F_1 AND F_3

$\therefore$ $F_4 = F_5$





(iii)

Transform the simplified query into fragment query by applying canonical expression based on the given fragmentation schema..

Answer :

In the previous section, we can see after simplification of operator tree the result is '$\emptyset$'. Any fragment query that results '$\emptyset$' is equivalent.

∴ simplified fragment query, (EMP_1 DF EMP_1)

(iv)

Write the equivalent query obtained from the simplified tree.

Answer:

After simplify the operator tree, the result is 'Ø'.

Any query related to given global schemata is equivalent.

∴ simplified equivalent query, (EMP DF EMP)