

SQL Query

<u>Exec</u>		Rel. Algebra
5	SELECT Target columns	Π project
1	FROM table A, table B,	\times product
2	WHERE Row search condition	σ select
3	GROUP BY grouping attribute	grouping \bowtie
4	HAVING group selection condition	σ select
6*	ORDER BY Sorting order attributes	sorting

List major code with student count of at least 400 students with a minimum gpa of 3.5 (list the values in descending student count).

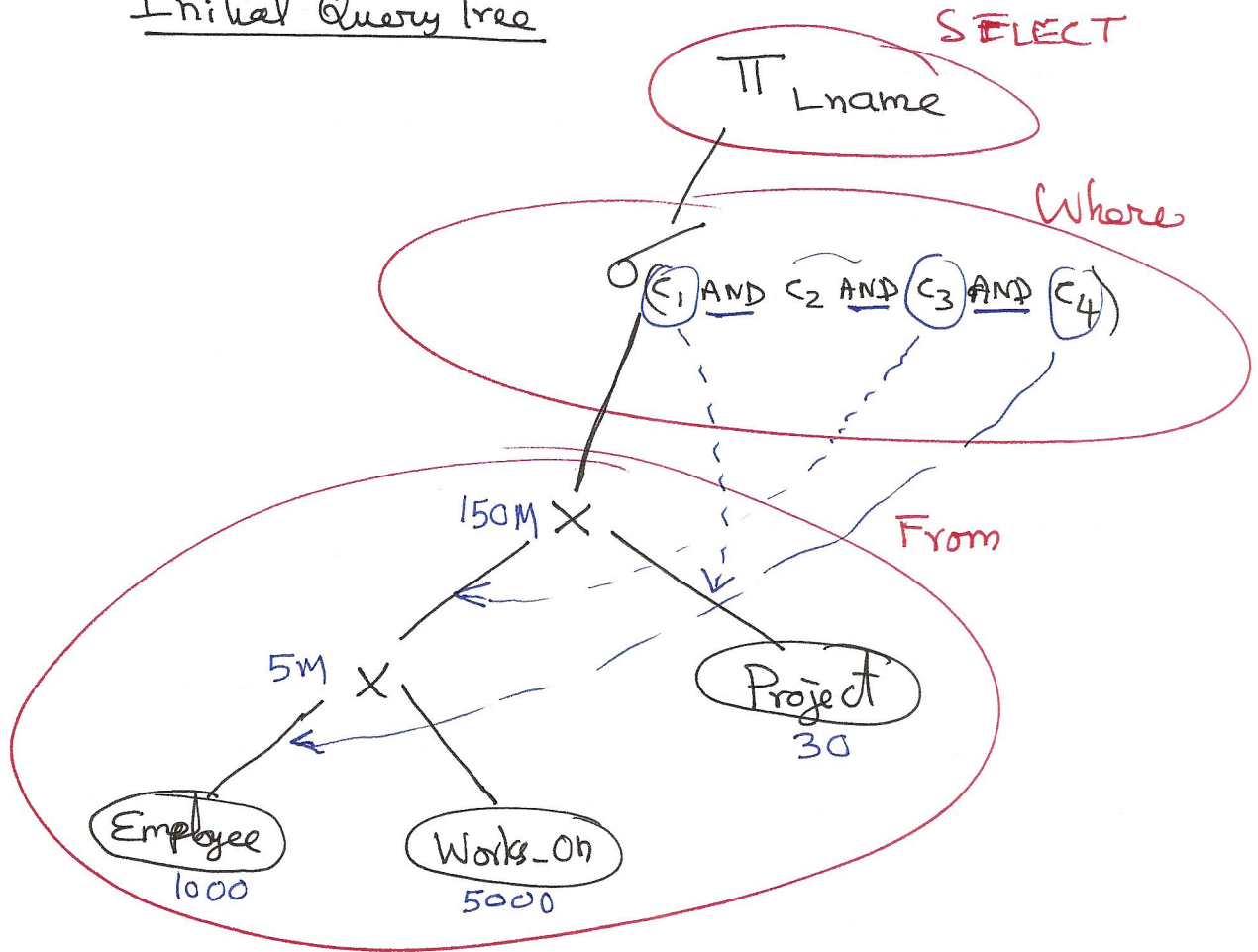
```
SELECT major, count(*)
FROM student
WHERE gpa >= 3.5
Groupby major
Having count(*) >= 400
Orderby count(*) desc
```

Figure 19.5 p704,705
 [List lastname of employees who work for 'AQUARIUS' project
 and born after '1957-12-31']

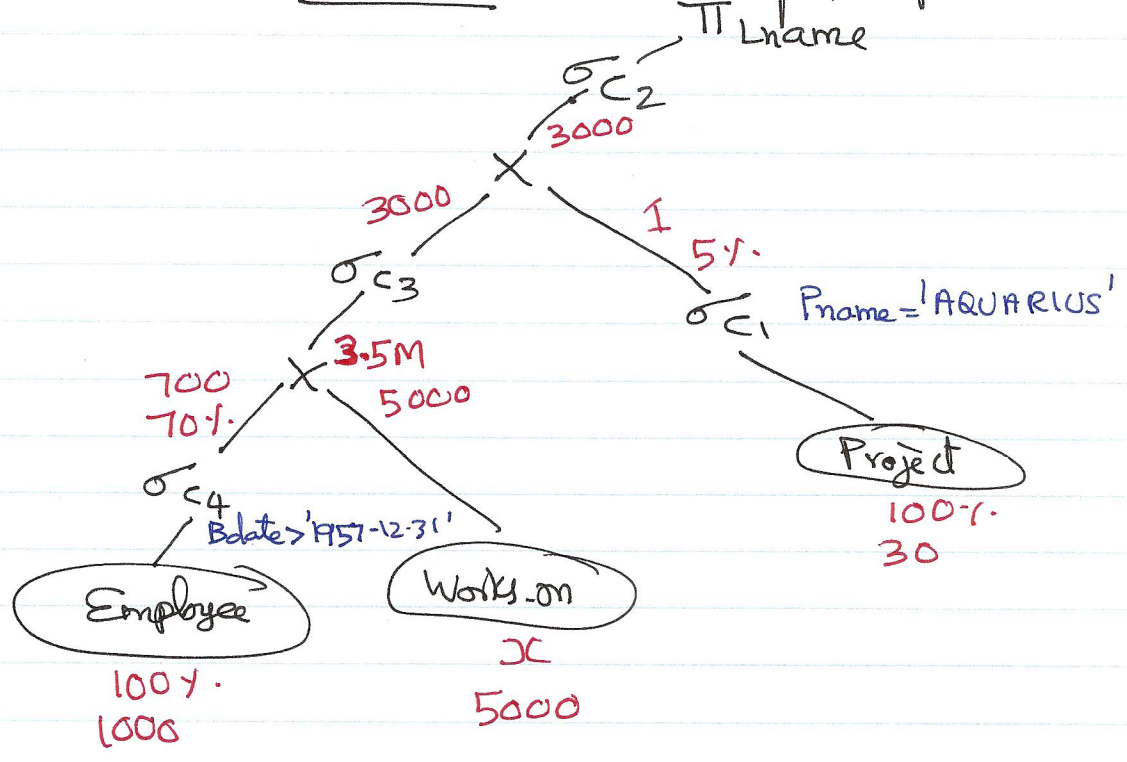
```

SQL
SELECT Lname
FROM Employee, Works_on, Project
WHERE c1 Pname = 'AQUARIUS' AND
      c2 Pnumber = Pno AND
      c3 ESSN = SSN AND
      c4 Bdate > '1957-12-31'
  
```

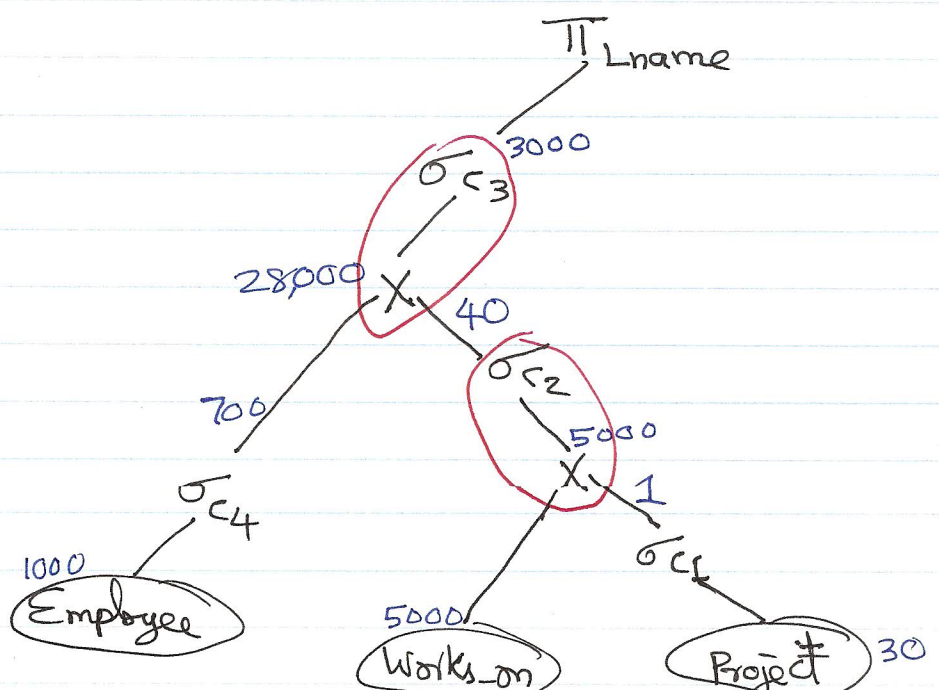
Initial Query Tree



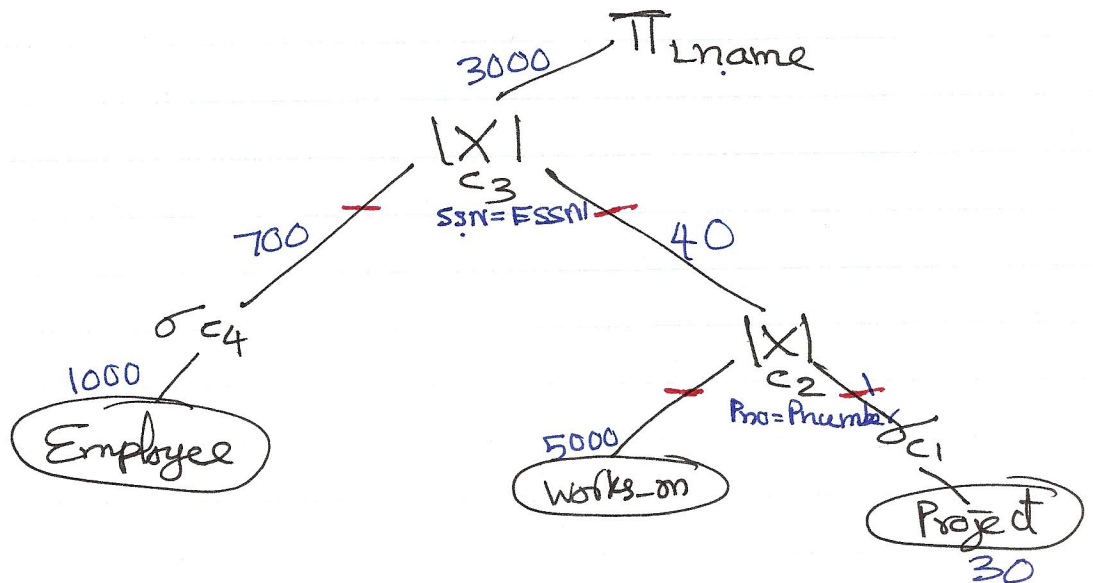
Rule 1: Breakdown Conjunctive (AND) selection conditions and move down the tree as far as possible



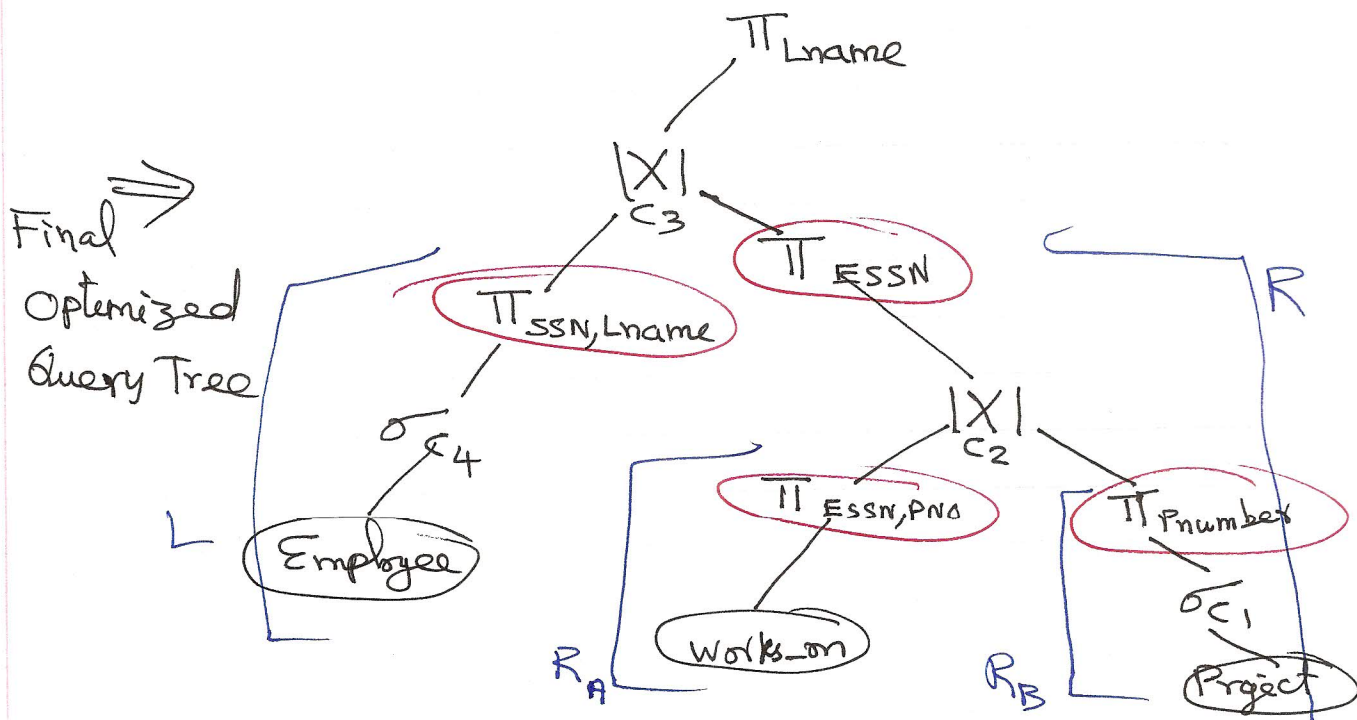
Rule 2: Reorder Product operations such that the product associated with the most restrictive selection be performed first.



Rule 3: Replace each pair of project and select operations with a join (sort-merge) operation.



Rule 4: Apply project operation in each branch of each join operation to reduce the width of the input tables to the join operation.



SQL Query for the optimized query Tree

SELECT Lname

FROM (SELECT SSN, Lname
FROM Employee
WHERE BDATE > '1957-12-31') as L

JOIN

(SELECT ESSN
FROM (SELECT ESSN, PNO
FROM works_on) as RA

JOIN

(SELECT Pnumber
FROM Project
WHERE Pname = 'AQUARIUS') as RB
ON RA.PNO = RB.Pnumber) as R

ON

L.SSN = R.ESSN