CS 186, Fall 1999
Midterm 2
Professor Hawthorn

REFERENCE DATABASE. This is the Reference Database referred to in this exam.

There are four tables. SALESPERSON contains the names, ids, regions & quotas for the salespeople. Ids are unique, names are not, and there is only one salesperson per region. PRODUCTS contains the product names, product ids, and prices for the products. The product ids are unique.

SALESPERSON

Sname	Sid	Region	Quota
Frances	25	TX	$100
Bob	31	CA	$150
Frances	74	MA	$200
Mary	89	FL	$250

PRODUCTS

Pname	Pid	Pprice
disks	131	$100
Intel pcs	152	$700
macs	831	$800
printers	255	$120
paper	221	$5

CUSTOMERS contains the customer names, customer ids, and regions for the customers (customer ids are unique), and ORDERS contains the customer id, the product id, and the product ordered per customer.

CUSTOMERS		
Cname	**Cid**	**Region**
Bob	1	TX
Harry	2	TX

Lin	3	MA
Martha	4	FL
Lin	5	FL
David	6	WI

	ORDERS		
Cid	**Pid**	**Quantity**	**Order_date**
1	152	1	3/4/99
2	152	1	6/8/99
4	831	1	3/5/00
4	131	1	2/1/78
5	255	1	7/5/99
6	831	1	8/3/98

Problem #1

Which of the following queries shows the Sids of the salespeople and the total sales that they have made? **(Only one answer is correct)**

A. SELECT S.Sid, SUM (P.Price * O.Quantity)
FROM Salesperson S, Orders O, Customers C, Products P
GROUP BY S.Sid
HAVING P.Pid = O.Pid AND O.Cid = C.Cid AND S.Region = C.Region

B. SELECT S.Sid, SUM (P.Price * O.Quantity)
FROM Salesperson S, Orders O, Customers C, Products P
WHERE P.Pid = O.Pid AND O.Cid = C.Cid AND S.Region = C.Region
GROUP BY S.Sid

C. SELECT S.Sid, Temp1.Sum1
FROM Salesperson S, (SELECT(SUM (P.Price * O.Quantity) AS Sum1)
FROM Orders O, Customers C, Products P
WHERE P.Pid = O.Pid AND O.Cid = C.Cid AND S.Region = C.Region) AS Temp1

D. SELECT S.Sid, SUM (P.Price * O.Quantity)
FROM Salesperson S, Orders O, Customers C, Products P
WHERE P.Pid = O.Pid AND O.Cid = C.Cid AND S.Region = C.Region

E. NONE OF THE ABOVE

Problem #2

Which of the following queries finds the regions for which there are no customers? **(Only one answer is correct!)**

A. SELECT S.Region
   FROM Customers C, Salesperson S
   WHERE S. Region NOT EQUAL C.Region

B. SELECT C.Region, COUNT (C.Region)
   FROM Customers C
   GROUP BY C.Region
   HAVING COUNT (C.Region) = NULL

C. SELECT C.Region
   FROM Customers C
               WHERE C.Region NOT IN
                  SELECT * FROM Salesperson

D. SELECT S.Region
   FROM Salesperson S
               WHERE NOT EXISTS
                     (SELECT * FROM Customers C
                           WHERE C.Region = S.Region)

E. NONE OF THE ABOVE

Problem #3

Which is the correct answer below for the following query:

```
SELECT S.Sid, S.Region, C.Cname,
FROM Salesperson S LEFT OUTER JOIN Customers C
ON C.Region = S.Region
```

A.

Sid	Region	Cname
25	TX	Bob
25	TX	Harry
31	CA	*Null*
74	MA	Lin
89	FL	Martha
89	FL	Lin

B.

Sid	Region	Cname
25	TX	Bob
25	TX	Harry
31	CA	*Null*
74	MA	Lin
89	FL	Martha
89	FL	Lin
Null	WI	David

C.

Sid	Region	Cname
25	TX	Bob
25	TX	Harry
74	MA	Lin
89	FL	Martha
89	FL	Lin

D.

Sid	Region	Cname
25	TX	Bob
25	TX	Harry
74	MA	Lin
89	FL	Martha
89	FL	Lin
Null	WI	David

E. NONE OF THE ABOVE

Problem #4

Which of the following queries finds most expensive part? **(Only one answer is correct!)**

A.

```
SELECT P.Pid
FROM Products P
WHERE P.Pprice = MAX (P.Pprice)
```

B.

```
SELECT P.Pid, MAX (P.Pprice)
FROM Products P
GROUP BY P.Pid
```

C.

```
SELECT P.Pid
FROM Products P1, Products P2
WHERE P1.Pprice > P2.Pprice
```

D.

```
SELECT P.Pid
FROM Products P
WHERE P.Pprice = (SELECT MAX (P.Pprice)
               FROM Products P)
```

E. NONE OF THE ABOVE

Problem #5

Given the query:

```
SELECT C.Cname
FROM Customers C, Orders O
WHERE C.Cid = O.Cid and O.Pid IN
        SELECT O.Pid
        GROUP BY O.Pid
        HAVING COUNT (*) > 1
```

What is the result?

A.

Bob
Harry
Lin
Martha
David

B.

Bob
Harry
Lin
Martha

C.

Martha

D.

David

E. NONE OF THE ABOVE

Problem #6

What does the following query do (select one answer)?

```
SELECT Sname FROM Salesperson
WHERE Region IN (SELECT Region FROM Customers WHERE Cid = ANY
                    (SELECT Cid FROM Orders)
                              GROUP BY Cid
                              HAVING COUNT (*) = (SELECT MAX (cnt)
                                                        FROM (SELECT COUNT (*) as cnt
                                                             FROM Orders
                                                             GROUP BY Cid)))
```

A. Finds the names of the salespeople for the customers who have the maximum number of orders.

B. Finds the names of all the salespeople who have the maximum number of customers.

C. Finds the names of all the salespeople who have more than one region.

D. Finds the names of all the salespeople who have any orders.

E. NONE OF THE ABOVE

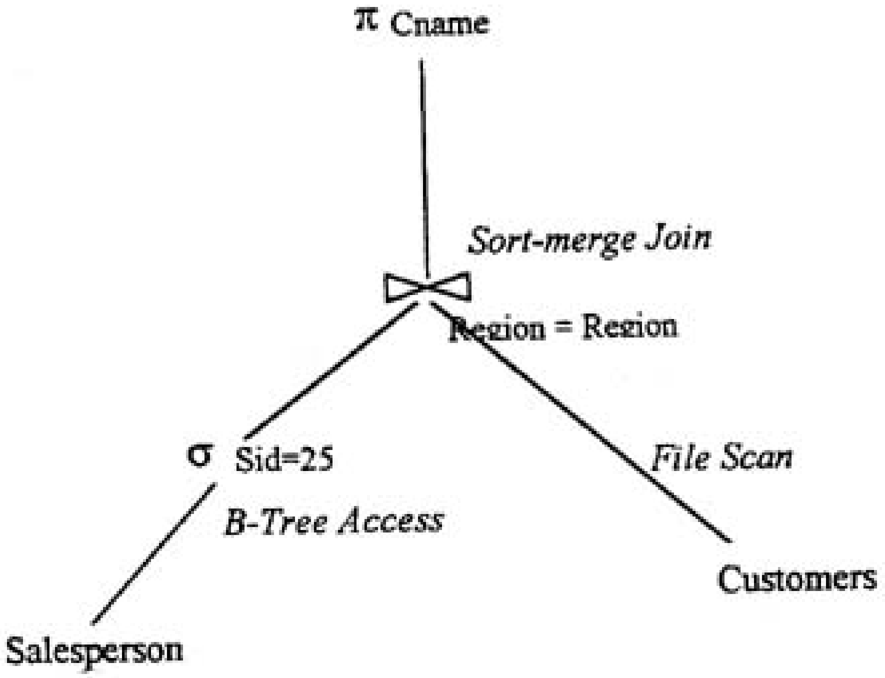
Problem #7

Assume that Customers and Salesperson are much larger than pictured on Page 1; that Customers has 100 pages, 10 records per page, and that Salesperson has 50 pages, 5 records per page. Assume that the only indexes are: Salesperson has a clustered B-tree index on Sid, and a Hash index on Sname and Customers has a clustered B-tree index on Cid. Assume there are 10 buffer pages available.

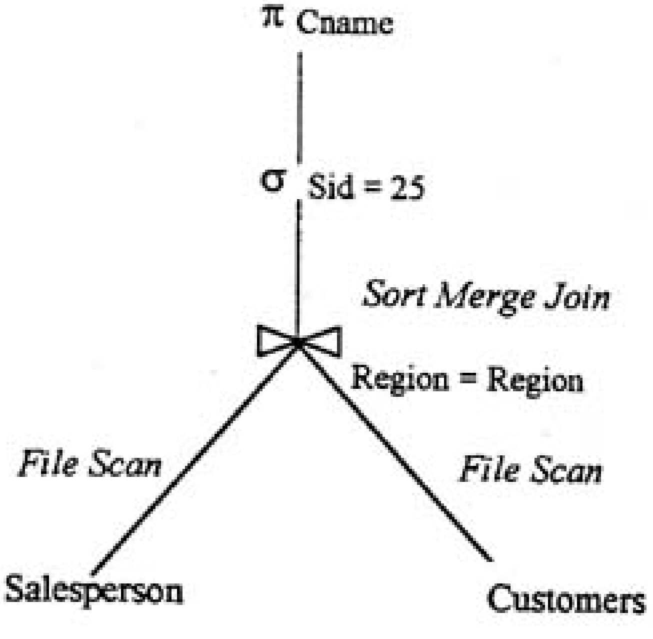
What is the lowest cost query plan for the query: SELECT C.Cname FROM Customers C, Salesperson S

WHERE S.Region = C.Region AND S.Sid = "25"?

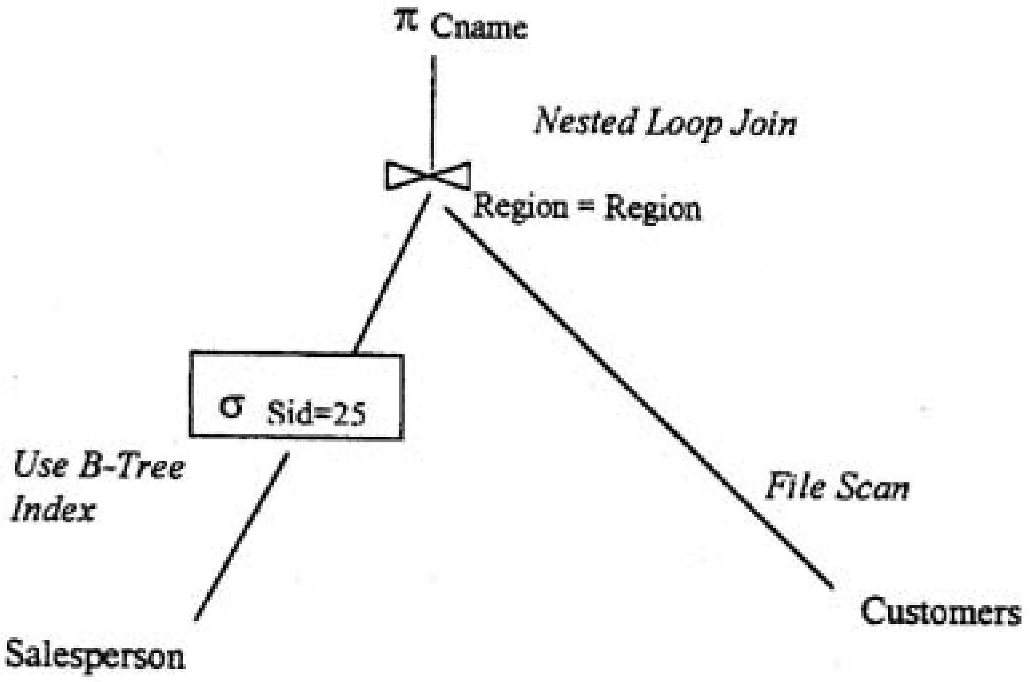
A.



B.



C.



Problem #8

The new DBA for the Reference Database has been given the following advice. Which *one* statement is always true?

A. Always put relations into third normal form

B. Always put hash indexes on fields used in equality selections

C. Never use two queries for something that can be expressed in one query

D. Always understand the workload on the system

Problem #9

Let us assume that Customers and Salesperson are much larger than pictured on Page 1, and in addition that Orders is much larger than pictured on Page 1. Assume that the only indexes are: Salesperson has a clustered B-Tree index on Sid, and a Hash index on Sname; Orders has a clustered B-tree index on (Cid, Pid) and Customers has a clustered B-tree index on Cid.

Consider the query:
SELECT S.Sname
FROM Salesperson S, Customers C, Orders O

WHERE S.Region = C.Region AND C.Cid = O.Cid and O.Pid = 152

Select the *one* statement below which is true.

A. No matter what the size of the relations, doing the selection O.Pid = 152 first will always be part of an optimal plan.
B. No matter what the size of the relations, an optimal plan will always need to scan Salesperson more than once.
C. No plan can use both keys in the (Cid, Pid) index.
D. If Orders is very much larger than Customers, using the (Cid, Pid) index to join Orders and Customers will cost less than a sort-merge join

Problem #10

A new DBA has been hired for the Reference Database. They have done a worload analysis and determined that the most important and frequent query is the Sum_orders query which sums up the dollar amount of each customer's order per day. To optimize this query, they decided that instead of having two different relations named Parts and Orders, there will be only relation:

> Parts_Orders, with fields Pname, Pid, Pprice, Cid, Quantity, Order_Date. The Pid (Product ID) and is unique, and a single customer cannot order the same part twice on the same day. Select the one statement below which is true.

A. The new design will always result in running the Sum_orders query faster than having two tables.
B. The Parts_Orders table has two functional dependencies: Pid -> (Pname, Pprice) and (Cid, Pid, Order_Date) -> Quantity
C. The Parts_Orders table is invalid because it is in first normal form.
D. The Parts_Orders table is invalid because it has two keys.

Problem #11

The following expression is in the where clause of a query:

((3 = 3) or (7 <> null)) and (3 <> null)

What does the above expression evaluate to (under 3 value logic)? [<> means not equal to]

A. True

B. False

C. Unknown

D. None of the above

Problem #12

We have two relations, A and B. A has 1000 tuples in 50 pages. A and B both have a clustered index on id; also id is a key for reach relation. If the query is

SELECT A. Name
FROM A, B
WHERE A.id = B.id

And we have two join methods, Block Nested Loop and Index Nested Loop, under what circumstances will Index Nested Loop result in dramatically fewer I/Os than Block Nested Loop?

A. If B has 100 tuples in 5 pages, and there are 25 buffers available, in addition to enough buffers to assure that the indices are in the buffers (if needed).
B. If B has 1000 tuples in 50 pages and there are 55 buffers available, in addition to enough buffers to assure that the indices are in the buffers (if needed).
C. If B has 10,000 tuples in 500 pages and there are 25 buffers available, in addition to enough buffers to assure that that the indices are in the buffers (if needed).
D. If B has 10,000 tuples in 500 pages and there are 502 buffers available, in addition to enough buffers to assure that the indices are in the buffers (if needed).

Problem #13

Assume we have a relation A that has 10,000 tuples, the values of its attribute x range from 7 to 80. And there are 50 distinct values of x. We also have relation B, which has 20 tuples, and the values of its attribute y range from 10 to 50. There are 2000 pages in A and 5 pages in B, and there are at least 10 buffer pages available. Consider the join

```
SELECT A.x
FROM A,B
WHERE A.x = B.y
```

Now suppose that y is a candidate key for relation B. If attribute x is not a candidate key, and A is already clustered on a different key, x is uniformaly distributed, which *one* statement below is true to assure the lowest cost for this query?

A. A good DBA will put a B-tree index on A.x but B.y does not need an index because it fits in memory.
B. A good DBA will put a hash index on A.x and a hash index on B.y.
C. A good DBA will put a B-tree index on A.x and a clustered index on B.y.
D. A good DBA will put a hash index on A.x and a clustered index on B.y.

Problem #14

The new DBA for the Reference Database needs to make sure that the salesperson cannot change their own quotas. There is a group Snums which defines the system ids of the salespeople, and the salespeople alreayd cannot delete anything in the Salesperson relation. Which of the following SQL statements should be used?

A. REVOKE UPDATE ON Salesperson(Quota) FROM Snums
B. REVOKE INSERT, UPDATE ON Salesperson(Quota) FROM Salesperson.Sid where Salesperson.Sid IN Snums
C. REVOKE SELECT ON Salesperson(Quota) FROM Snums
D. ON INSERT INTO Salesperson CHECK Salesperson.Sid NOT EQUAL Snum

Problem #15

Given the following sequence of events

- Joe created a table called Customers for his database class.
- Joe gave his project partner Cathy Select privilege on Customers with the option of granting Select permission.
- Joe gave his other project partner Dennis Select privilege on Customers with the option of granting Select permission.
- Dennis in turn decided to give select privileges to his friends Peter, and Mary (to show off his cool tables he created).
- Cathy also being a friend of Peter, also decided to give Peter select privileges to the Customer's table.
- After the 3rd week of classes, Dennis decided to drop the class, and so Joe revoked Dennis' privileges with the cascade option.

Which of the following is a list of people who still have SELECT privileges from the Customer table?

A. Cathy and Joe
B. Joe ONLY

C. Joe, Cathy, Peter, Mary

D. Joe, Cathy, Peter

E. Joe, Cathy, Mary

Problem #16

Given the following Query

SELECT *
FROM Salesperson S, Customers C, Orders O, Products P
WHERE S.region = C.region AND O.cid = C.cid AND O.pid = P.pid AND O.cid = 5

Assume that there are no indexes on any of the tables. Which of the following join orders will have the least I/O cost.

A. (((S, P) C) O)
B. (((C, S) P) O)
C. (((O, C) P) S)
D. (((C, S) O) P)
E. (((O, S) C) P)

Clarification: Choice A means we first join S and P, then join that result with C, and finally join that result with O.

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