

## Quiz 2 Solutions

1) Let  $l$  be the fixed length of the row of a relation  $R$  with  $N$  rows, and  $B$  be the block size. Let  $l$  be smaller than  $B$ , and let unspanned placement of rows in blocks be used. There is no header or footer in the block. Then, Select one or more:

- a. Number of blocks needed to store  $R$  is exactly  $\lceil N/\text{floor}[B/l] \rceil$
- b. Number of rows per block is exactly  $\text{floor}[B/l]$
- c. Number of rows per block is exactly  $\lceil B/l \rceil$
- d. None of the others
- e. Number of blocks needed to store  $R$  is exactly  $\lceil N/\lceil B/l \rceil \rceil$

**CORRECT ANSWERS – A,B**

2) Consider  $R(K, A_1, A_2, \dots, A_n)$  with a composite clustered index on  $(A_1, A_2)$ ,  $R$  has  $N$  rows, and  $A_1$  has  $p$  distinct values and  $A_2$  has  $q$  distinct values for a populated relation  $R$ . Select one or more:

- a. None of the others
- b.  $R$  is ordered on  $K$
- c.  $R$  is ordered in  $(A_1, A_2)$  (first  $A_1$  and then  $A_2$ )
- d. Composite Clustered index on  $(A_1, A_2)$  has  $(p+q)$  rows
- e. A row of clustered index is  $(A_1\text{-value}, A_2\text{-value}, \text{BlockPointer})$

**CORRECT ANSWERS – C,E**

**EXPLANATION**

- B is wrong because as it is a clustered index on  $(A_1, A_2)$  it has to be ordered on  $(A_1, A_2)$  and it cannot be ordered on  $K$ .

- C is correct because it is a clustered index on  $(A_1, A_2)$  so it must be ordered on  $(A_1, A_2)$

- D is wrong because,  $A_1$  has  $p$  distinct values and  $A_2$  has  $q$  distinct values, so total number of possible combinations of  $(A_1, A_2)$  is  $p \times q$ .

- E is correct by definition

3) Consider  $R(K, A_1, A_2, \dots, A_n)$  with  $N$  rows, and a secondary index on  $K$ . Select one or more:

- a. None of the others
- b. A row of secondary index on  $K$  is  $(K\text{-value}, \text{BlockPointer})$
- c. There are  $N$  rows for the secondary index on  $K$
- d.  $R$  is ordered on  $K$
- e.  $R$  is ordered on any attribute other than  $K$

CORRECT ANSWER – A

EXPLANATION

- B is wrong because it should be recordPointer not blockpointer
- If  $K$  was mentioned as Key then C would have been correct, as there would have been  $N$  distinct values and thus  $N$  rows. But it is not mentioned.
- D is wrong because, It is a secondary index on  $K$  so it must not be ordered on  $K$
- E is wrong because, It is not necessary that  $R$  has to be ordered. It may not be ordered on any attribute.

4) Consider a relation  $R(K, A)$  with  $N$  rows stored in  $nR$  blocks and attribute  $A$  takes only two values  $(x, y)$ , there are  $(N-1)$  rows with value  $A=x$ , and 1 row with value  $A=y$ . To retrieve all rows for the query  $\text{Select } * \text{ From } R \text{ where } A=y$ . To get this result - Select one or more:

- a. If  $R$  is hashed on  $A$ , it will take exactly one block access.
- b. If  $R$  has clustered index on  $A$  it will take exactly two block accesses
- c. If  $R$  is ordered on  $K$  it can take  $\lceil \log_2(nR) \rceil / 2$  block accesses
- d. None of the others
- e. If  $R$  is unordered it can take  $\lceil nR/2 \rceil$  block accesses

CORRECT ANSWERS – A,B,E

EXPLANATION

- A is correct by definition

- For clustered index it will take:

$BA = \log_2(\text{number of distinct keys}) + \text{No. of occurrences}$

$BA = \log_2(2) + 1$

$BA = 1 + 1 = 2$

- Option C is Wrong If R is ordered on K then binary search cannot be done for A (So logarithm cannot come into the picture)

- Option E is correct as R is unordered, the best case would be 1 block access, worst case would be nR block accesses. On average  $\text{floor}(nR/2)$  block accesses would be required.

5) If consider a relation with >10 rows, the block size B is doubled, then Note - (approximately half is number in range  $[(\text{number}/2) - 3]$ , to  $[(\text{number}/2) + 3]$  ), not necessarily exactly half - but very close to it. Select one or more:

- a. The number of blocks for secondary index on Key will remain the same
- b. None of the others
- c. The number of blocks for primary index will remain the same.
- d. The number of leaf nodes of B-tree will approximately halve
- e. The number of blocks for clustered index on non-key attribute A will approximately halve

CORRECT ANSWERS – D,E

EXPLANATION

- Option A is wrong because as block size increases, more keys could be held in a block, so basically number of blocks for SI will half.
- Option C is wrong using the same explanation for Option A.
- Option D is correct because as block size doubles, fanout also doubles, so minimum <key,ptr> pairs in each block will double. So finally the overall number of blocks required in the B-Tree will also half. Therefore no. of Leaf Nodes will be halved.
- Option E is true because block size increases, number of rows per block increases, double the number of keys could be stored in one block. Therefore number of blocks will half.