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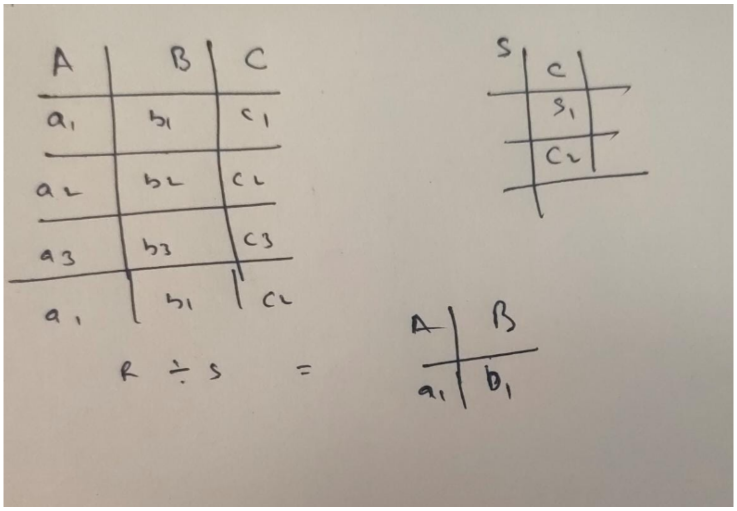
1. (c)This is basically a division operation like r/s. Which means that in the final output we will have A & B attribute and only those which have all the values of S in C attribute.
   ex:



A	B	C
a_1	b_1	c_1
a_2	b_2	c_2
a_3	b_3	c_3
a_1	b_1	c_2

S

C
s_1
C_2

R ÷ S =

A	B
a_1	b_1

   So , the answer is option C that is we need to find all the tuples of <A,B> from r where every tuple of C from S is present

2. (a)We can only have 1 primary key on one relation. In primary index the search key is the primary key/Alternate key and it is physically ordered in DB, so other keys will automatically be unordered hence at most 1 primary index is possible for a relation

3. (d)There are 4 splits in worst case:
   After inserting in 206
   after inserting 204
   after inserting 202(there will be an internal node split and a leaf node split)
   after inserting 201

4. (b)It is false because there are some other failure which also exsists other than system crash like disc failure, transaction failure which can be overcomed with undo operation

5. (b)As over here T1 and T2 are in conflict. So it is not conflict seriazable. As teh graph has cycle therefore S is neither conflict nor view serializable.

6. (b)The protocol requires that all exclusive mode-locks taken by a transaction be help until the transaction is committed and not only just the locking of two phases, Although this decreases the concurrency level but it insteads helps avoiding cascading rollbacks

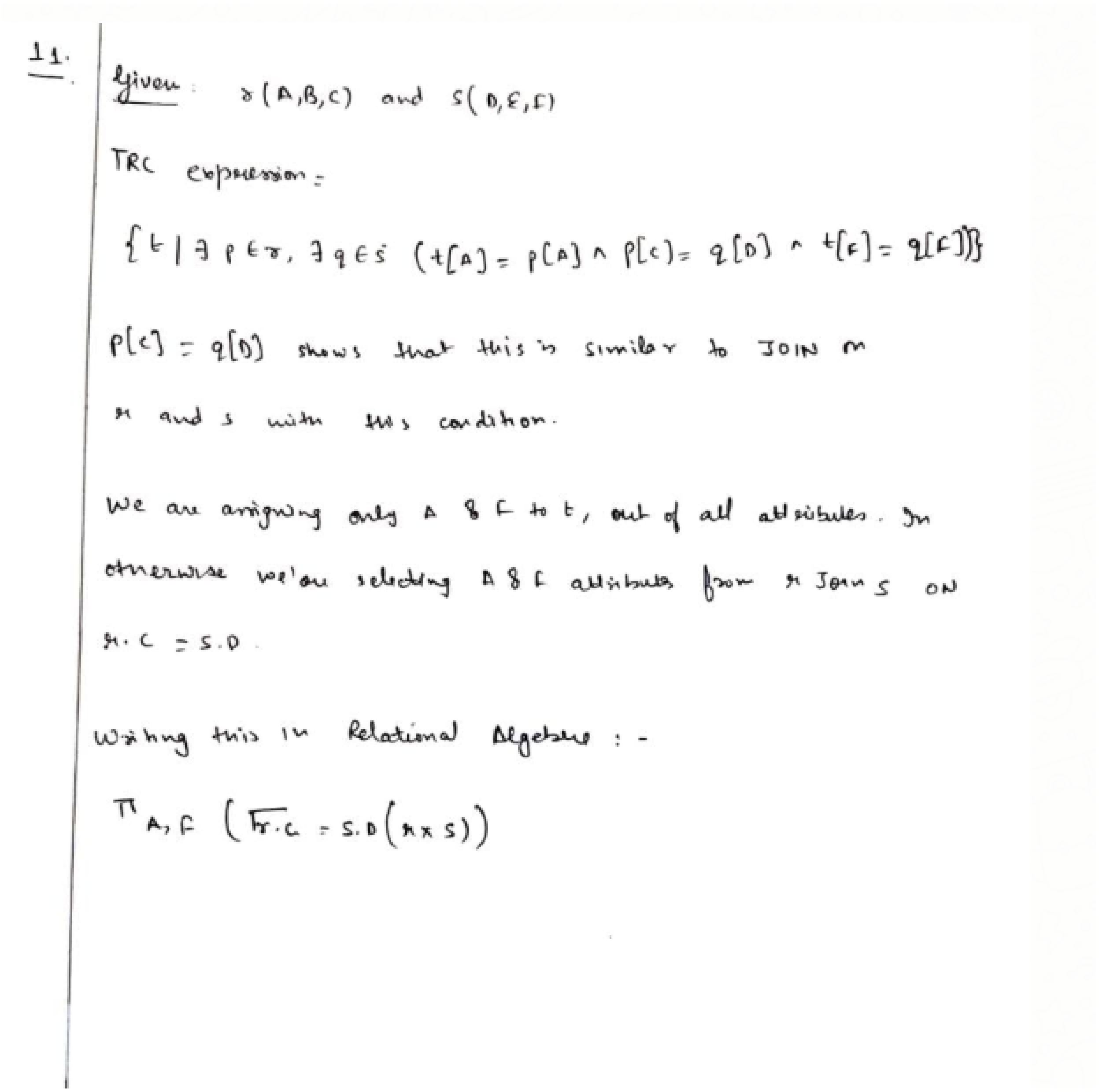
7. (a)This protocol ensures conflict serializability as it ia a graph protocol and hence due to the property of graph protocol we can say the same.

8. (c)Bitmap index are useful when attributes take on a small number of distinct values like gender etc. Since the domain of attribute is binary. So bitmap Index is the best fir here s there are only 2 distinct vales of the attributes.

9. (c)As the hashing is taken mod 4 so we will convert the numbers into binary form and then as no bucket can store mor ethan 2 records we willl split the buckets and it will finally point to bucket 2

10. (c) From the log records we can say that it is deferred database modification method. After redoing a transaction Ti sets all the data items to their updated value . As we know that for recovery the transaction needs to be redone but if and only if both <Ti start> and <Ti commit> are present in the log.

11.



11.

Given: $r(A,B,C)$ and $s(D,E,F)$

TRC expression:

$$\{t \mid \exists p \in r, \exists q \in s\ (t[A] = p[A] \wedge p[C] = q[D] \wedge t[F] = q[F])\}$$

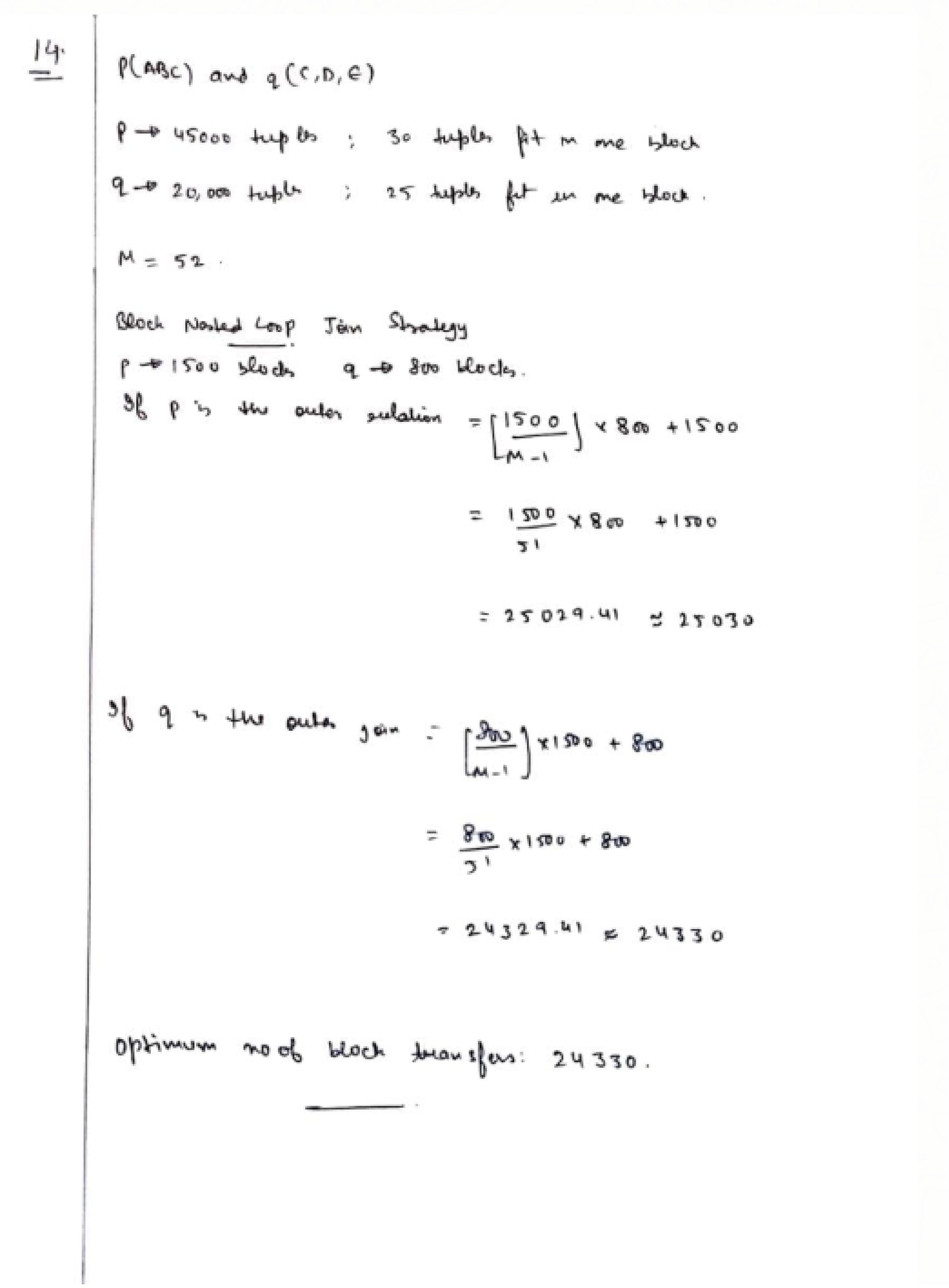
$p[C] = q[D]$ shows that this is similar to JOIN m r and s with this condition.

We are assigning only A & F to t, out of all attributes. In otherwise we'are selecting A & F attributes from r Join s ON r.C = S.D.

Writing this in Relational Algebra :-

$$\pi_{A,F}\left(\sigma_{r.C = s.D}(r \times s)\right)$$

14.



14.

P(ABC) and q(C,D,E)

P → 45000 tuples ; 30 tuples fit in one block

q → 20,000 tuples ; 25 tuples fit in one block.

M = 52.

Block Nested Loop Join Strategy

P → 1500 blocks q → 800 blocks.

If P is the outer relation $= \left[\frac{1500}{M-1}\right] \times 800 + 1500$

$= \frac{1500}{51} \times 800 + 1500$

$= 25029.41 \simeq 25030$

If q is the outer join $= \left[\frac{800}{M-1}\right] \times 1500 + 800$

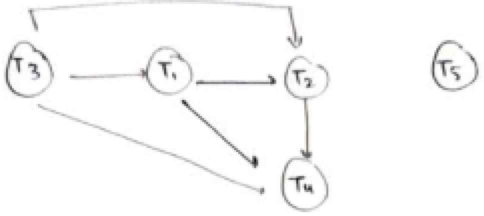
$= \frac{800}{51} \times 1500 + 800$

$= 24329.41 \simeq 24330$

optimum no of block transfers: 24330.

15.

Que 15: Precedence Graph



It is conflict serializable. as no cycle exists .

We can get its serial order by topological sorting. One of the order is

$T_3 \longrightarrow T_1 \longrightarrow T_2 \longrightarrow T_4 \longrightarrow T_5$ (Here T_5 can be performed at any order / place since it is disconnected with the rest serial order)

T_3	T_1	T_2	T_4	T_5
RA				
RB				
WC				
	RC			
	WB			
	WA			
	WC			
		RB		
		RD		
			RD	
			WD	