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CS 208
 SAKSHAM RATHI
22B1003
QUESTION 1
1. 9. = 1 word with all for what were
 Consider equation ia:
   (x; \land Q_1) \rightarrow Q_2
q x_1 = \bot \quad \text{then} \quad x_1 \land Q_1 = \bot
Q_2 \text{ can be } \bot \text{ or } \top
   4 oli = #T then oli 1 4, = # 1
                 G<sub>2</sub> can be T or ⊥
now consider equations ib:

(2: 1(2) -> 9,
  This will be true only when (2:192) = 1
   1 9 oi = T then 92 = 1
      If ni= I then Q2 = I on T
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If any of the x; (iESI,2...n3) is I, then 99 Q2=1 But if all of x; are I then Q2 can be I or T.

The touth table of q_2 will have 2^n nows For I now (with all or; = 1) we will have two possibilities of φ_2

2 semantically distinct formulas φ_2 crist. Les Tes de Mos 30

Ce can be T on 1

sorvides equations its:

(2) 1 (D) - 4,

TO = 10 V 100 MAT 上面 = 30 1

of sit of them to be

2. Qb= Ton offer andtoups on such on the Consider equation is a surely set town most to (ai 1 (1)) 42 ar = I then ar Aq= I Ce2 com be I on T ori = T than or 1 1 Q = T Q2 can be T Consider equation it: (Ni 1 (2) -) Q, \$ Q=T = (x: 1 Q2) can be I on T Mence, we won't get any constraint from these equations. If all x; we It, then 92 can take Values I or T, close it will be T : 2 sementically distinct formulas 92

3. We have 2n equations with us, all of them must be tous => their 'and' should also be tome (21: 1 (e)) - Q2 Consider (1ix) 0 ~ (xi1() V (2) (211 1 (22) - Ce, @ (ib) (=) ~ (211 1 (92) V (9, Taking and of these two Tia) 1 (ib)) (~(a; 14,) v(2) 1 (~(a; 142) V(2)) 3 (~x; V.x, V (2) 1 (~x; V.x, V (1) =) (~xi) V ((~Q, VQ2) ~ (~Q2VQ1)) =)(~xi) V ((~Qin ~Q2) V (~Q1 ~Q1) V $(Q_2 \cap Q_1) \vee (Q_2 \cap Q_2)$ =)(~xi) V (~Q, 1~Q2) V (@Q, 1 Q2) If a; is false, this is always tome If It is true then

should be true.

Touth Table for this:

Q1 Q2 Q11Q2 Q11~Q2 (0	e, n(e2)/ (-a, n-a2)
	4/1
0 0	0
1, 0	100
1 her 1 may	

=)
$$Q_1 = Q_2 = 0$$
 or $Q_1 = Q_2 = 1$

all ai are false then q and q can take any value (2x2=4)

The like, in any case
$$(Q_1 = Q_2) \Rightarrow \text{only}$$

2 values

There are total 2^n rows of variables For one now there are 4 options For other (2^n-1) grows there are 2 options

Total number of pairs =

$$2^{n-1} \times 4 = 2^{n-1+1} (2^{n+1})$$

4h we can take hints from the forevious part in this quastion. If one of the ai is T then $Q_1 = Q_2 \implies$ only one formula 2 will exist for a. But, if all of the x;'s are I then Q, dez can take any values. Q=L -> Q= L orT PI=T -> (Pr==) Lort une and Therefore, there does not exist any formula Q, such that there is exactly one formula Q2. ene mon there are 4 options

entito of sure there are a plane

(4°C) 3+1°C = 1 × 1°C =