Rishika Varma. K
CS18B045

DBMS Endsem part - 2

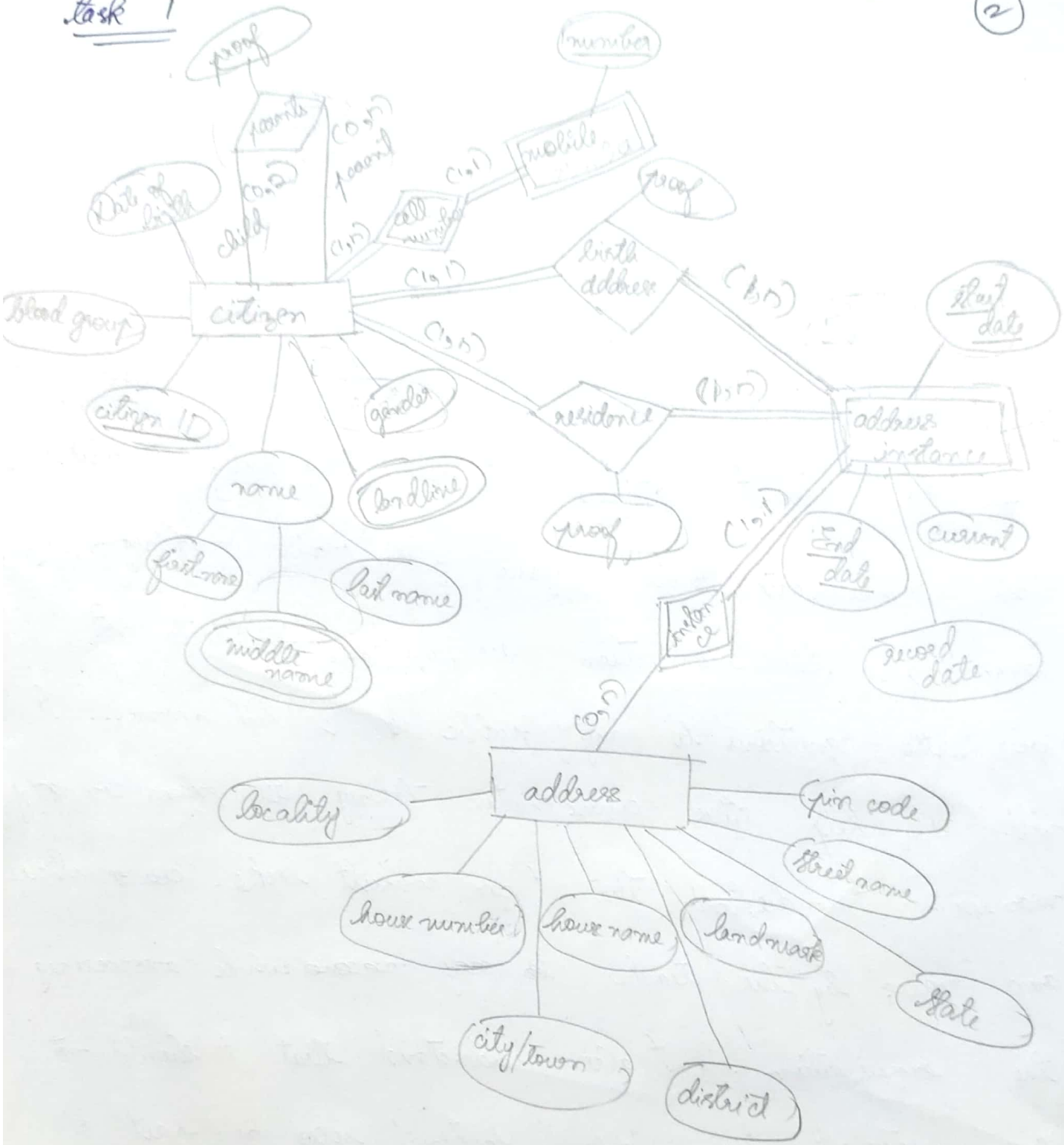
Task - 0

I understand that take home examination is to test my own understanding of the subject and I will offer an honest attempt to meet this goal. I will not communicate with anyone else while working, answering the examination problems/tasks. I will not post the questions to any public fora & seek answers. I will not help other course-mates taking the exam in any manner. I understand that I can consult books, course slides and videos by the teacher ~~is~~ ~~copy~~ ~~course~~ while answering the examination. I also understand that I should not copy materials from books, internet sites as part of my answers for the exam questions/tasks. These restrictions apply for the whole exam duration (till deadline for submission)

Rishika.

Rishika Varma. K

Task 1



for this database, I made 4 entities, citizen, address, address instance and mobile. Here address instance & mobile are weak entities as they dont exist without a address & citizen respectively

The attributes for citizen are all the details required like name, citizen ID, gender, DOB, landline numbers, blood grp etc. I made mobile a separate entity as there is atleast 1 or more & this can't be captured by an attribute. The parents of a citizen are modeled as a recursive relationship with proof documents as attribute. I assumed that a child has at most 2 parents.

Each time an address is given as previous or present address of a citizen, it is modelled through the relation instance and weak entity address instance with attributes start & end date of living where end date is nullable if it is present address, date of recording and a boolean attribute current to represent if it is present address. The citizen and address instance have a relation residence to represent all the addresses

that that person stayed and the durations. I assumed that a house has only 1 way of writing an address for and there are no variations to it.

Task - II

1. Each operation in RA can be represented exactly using TRC.

select :-

$$\sigma_c(R_j)$$

this means that tuple belongs to R_j & we need those satisfying c.

TRC query P

$$\Rightarrow \{t \mid \exists t \in R_j \wedge c\}$$

Here $\forall$ tuple $t \in \sigma_c(R_j)$

$t \in R_j$, t satisfies c

$\therefore$ t is present in R

project :-

$\Pi_{A_i}(R_j)$

⇒ t is in R_j and we need A_i from t

if RA query works ⇒ $A_i \in R_j$

∴ TRC query will be $\{A_i \mid \exists t \wedge t \in R_j\}$

~~join :-~~

~~$R_i \bowtie_c R_j$~~

~~here it~~

combination of above :-

$\Pi_{A_i}(\sigma_c(R_j))$

⇒ as we want a particular attribute from result of select, TRC can do the same

⇒ $\{A_i \mid \exists t \wedge t \in R_i \wedge c\}$

. join :

$R_i \bowtie_c R_j$

as join can be written as combination of 2 conditions, first part $\in R_i$ & second part $\in R_j$

if attributes of R_i are $A_1 .. A_m$

and R_j are $A_n .. A_k$

$\Rightarrow$ TRC $\Rightarrow$ $\{(A_1 .. A_m, A_n .. A_k) |$

$\exists t_1 \in R_i \wedge \exists t_2 \wedge t_2 \in R_j]$

for set difference $R_i - R_j \Rightarrow$ in R_i but not $R_j \Rightarrow \{ t / \exists t_1 \in R_i \wedge t \notin R_j \}$

intersection, union act parallelly as part of condition C and C is put in TRC directly without any change.

Thus all other operations can be expressed using this (like crossproduct). and so all operations are translatable to safe TRC.

∴ Hence proved.

Task - III

1. $G^{(0)} = \{ABCD \to E, E \to D, A \to B, AC \to D\}$

step 2:

$G^{(2)} = \{ABCD \to E, E \to D, A \to B, AC \to D\}$

no change

step 3:

$ABCD \to E \Rightarrow BBCD \to E$

$\Rightarrow BCD \to E$

$\therefore BCD \to E$

$ABCD \to E$

$BDD \to E$

$\therefore BD \to E$

$BC \to D$

$BD \to E$

$E \to D$

$BCD \to D$

$CE \to D$

$\{BD \to E, E \to D, A \to B, AC \to D\}$

$\{AC \to E, E \to D, A \to B, AC \to D\}$

step 4:

~~$\{BD \to E, E \to D, AC \to B\}$~~

$\{AC \to E, E \to D, A \to B\}$

4. $F_2 = \{ A \to B, B \to C, C \to D \}$

$G = \{ A \to B, B \to C, A \to D \}$

both are minimal and equivalent

3. ~~$F_2 = \{ A \to B, C \to B,$~~

$F = \{ B \to C, BCDE \to A, B \to D, A \to D, BC \to E \}$

give different results.