

## Assignment

Que. Build a small genealogy knowledge base using predicate logic that

- contains facts of immediate family relations (spouse, parents etc.)
- contains definitions of more complex relations (ancestors, relatives)
- is able to answer queries about relationships between people

Apply resolution by refutation on the following predicates & facts to answer the query

if relative (Liz, Edwin) is true?

- ⇒ predicates : (given)
- parents( $x, y$ ), child( $x, z$ ), father( $x, y$ ), daughter( $x, y$ ), etc.
  - spouse( $x, y$ ), husband( $x, y$ ), wife( $x, y$ )
  - ancestor( $x, y$ ), descendant( $x, y$ )
  - male( $x$ ), female( $y$ )
  - relative( $x, y$ )

Facts :

- husband (Edwin, Mary), son (Bill, Edwin)
- ~~father~~ spouse (John, Nancy), male (John), son (Mark, Nancy)
- father (Tom, Nancy), daughter (Linda, Tom)
- daughter (Liz, Linda)

So the Relations as :-

parent( $x, y$ ) :  $x$  is parent of  $y$

child( $x, z$ ) :  $x$  is child of  $y$

father( $x, y$ ) :  $x$  is father of  $y$

Mother( $x, y$ ) :  $x$  is mother of  $y$

$\text{spouse}(x, y) : x \text{ is spouse of } y$   
 $\text{husband}(x, y) : x \text{ is husband of } y$   
 $\text{wife}(x, y) : x \text{ is wife of } y$   
 $\text{son}(x, y) : x \text{ is son of } y$   
 $\text{daughter}(x, y) : x \text{ is daughter of } y$

Facts :

(i) husband(Edwin, Mary)

male(Edwin)

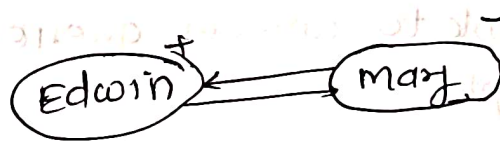
female(Mary)

spouse(Edwin, Mary)

spouse(Mary, Edwin)

wife(Mary, Edwin)

male +  
female -



(ii) son(Bill, Edwin)

male(Bill)

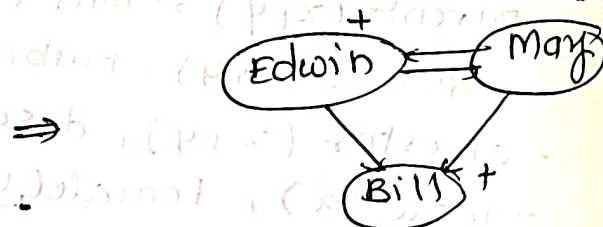
son(Bill, Edwin)

father(Edwin, Bill)

parent(Edwin, Bill)

$\therefore$  wife(Mary, Edwin)

$\therefore$  son(Bill, Mary)



(iii) spouse(John, Nancy)

male(John)

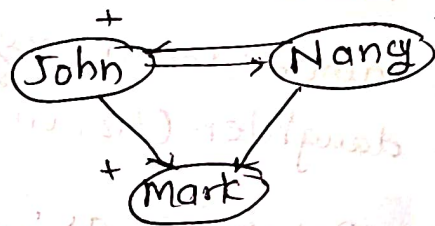
son(Mark, John)

female(Nancy)

husband(John, Nancy)

wife(Nancy, John)

male(Mark)



$\therefore$  spouse(John, Nancy)

$\therefore$  son(Mark, John)



(iv) father (Tom, Nancy)  
daughter (Linda, Tom)

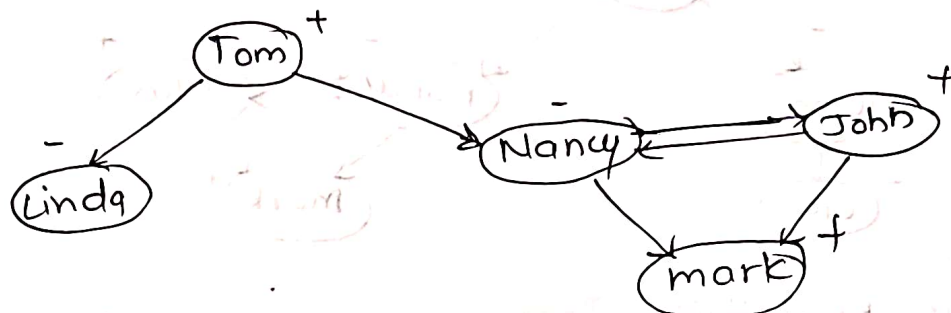
male (Tom)

female (Linda)

father (Tom, Linda)

daughter (Nancy, Tom)

sister (Linda, Nancy)



→ grandfather (Tom, Mark)

grandson (Mark, Tom)

son-in-law (John, Tom)

father-in-law (Tom, John)

brother-in-law (John, Linda)

sister-in-law (Linda, John)

aunt (Linda, Mark)

Nephew (Mark, Linda)

(v) daughter (Liz, Linda)

female (Liz)

mother (Linda, Liz)

→ grandfather (Tom, Liz)

granddaughter (Liz, Tom)

aunt (Nancy, Liz)

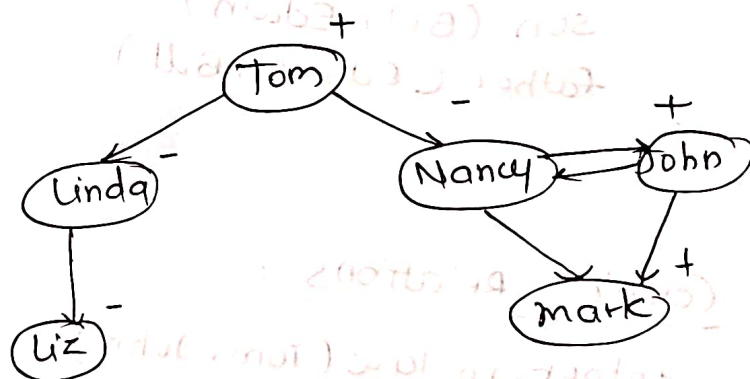
neice (Liz, Nancy)

uncle (John, Liz)

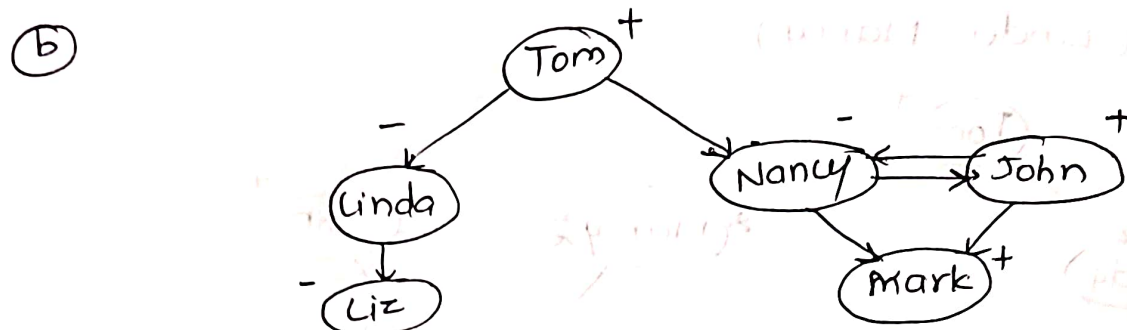
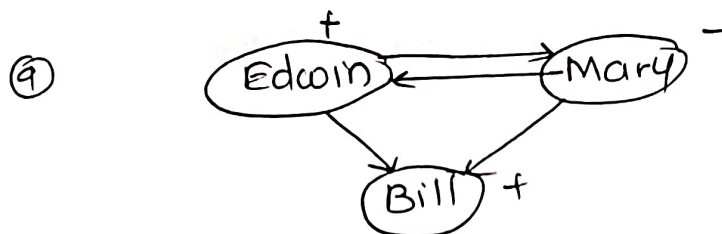
neice (Liz, John)

cousin (Liz, Mark)

cousin (Mark, Liz)



from the solved two family trees (we have



summary →

### Immediate Relations :

spouse (Nancy, John)  
 husband (John, Nancy)  
 spouse (John, Nancy)  
 wife (Nancy, John)  
 spouse (Edwin, Mary)  
 husband (Edwin, Mary)  
 spouse (Mary, Edwin)  
 wife (Mary, Edwin)  
 son (Bill, Edwin)  
 father (Edwin, Bill)

son (Bill, Mary)  
 mother (Mary, Bill)  
 daughter (Liz, Linda)  
 mother (Linda, Liz)  
 daughter (Linda, ~~John~~ Tom)  
 father (Tom, Linda)  
 son (Mark, Nancy)  
 mother (Nancy, Mark)  
 son (Mark, John)  
 father (John, Mark)  
 daughter (~~John~~ Nancy, Tom)  
 father (Tom, Nancy)

### Complex Relations :

father-in-law (Tom, John)  
 son-in-law (John, Tom)  
 grandfather (Tom, Mark)  
 grandfather (Tom, Liz)  
 grandson (Mark, Tom)  
 granddaughter (Liz, Tom)  
 aunt (Linda, Mark)  
 cousin (Liz, Mark)  
 cousin (Mark, Liz)

nephew (Mark, Linda)  
 aunt (Nancy, Liz)  
 niece (Liz, Nancy)  
 uncle (John, Liz)  
 brother-in-law (John, Linda)  
 sister-in-law (Linda, John)  
 ancestor (Tom, Mark)  
 ancestor (Tom, Liz)

Conclusion - query relative (Liz, Edwin) True?

⇒ False

There exists no direct connection between Liz & Edwin based on focus provided.