Exercise 3

We want to formalize knowledge about the domain of students and professors. In particular, we want to formalize the following statements:

1. every student is a person;
2. every professor is a person;
3. male and female are subclasses of person;
4. student and professor are disjoint classes;
5. the property "is friend of" has domain person and range person;
6. the property "studies with" has domain student and range student;
7. the property "studies with" is a subproperty of the property "is friend of";
8. every professor that is the supervisor of at least one student is an active professor;
9. every professor that is the supervisor of a male student and a female student is a very active professor;
10. every professor that is also a student is a special professor;
11. every professor is friend of at least one professor and is friend of at least one student.

(a) Choose the most appropriate knowledge representation language for expressing the above knowledge among the following: $\mathcal{ALC}$, Datalog with constraints, ASP, OWL, $DL\text{-}Lite_R$, $\mathcal{EL}$, RL, RDFS, motivating your choice;

(b) express the above knowledge in the formalism chosen at the previous point.

a)

1) All languages admitt it
2) All languages admitt it
3) All languages admitt it
4) Not possible in EL because it does not have negation. Not possible in RDFS because we do not have negation.
5) Not possible in EL because we do not have inverse role. Inverse role is not possible in ALC but we can rewrite range using universal constructor, so we can do in ALC.
6) Same as previous
7) Not possible in ALC because we do not have the subroles. Not possible in EL because we don't have the subroles.
8) Not possible in DL-Lite_R because we cannot have conjunction and also qualified existential restriction is not possible. Not posible in RDFS because we do not have qualified existential restriction and conjunction.
9) Same as previous
10) Not possible in DL-Lite_R because we cannot have conjunction. Not possible in RDFS because we cannot have conjunction
11) Not possible in RL because we cannot have concept expression in the right side of the formula that are different from atomic concept. Not possible in Datalog with constraints and ASP because this violate the safeness condition. Not possible in DL-Lite_R because we cannot have conjunction and also qualified existential restriction is not possible. Not posible in RDFS because we do not have qualified existential restriction and conjunction

b)

The only solution is RL

1) STUDENT subseteq PERSON
2) PROFESSOR subseteq PERSON
3) MALE subseteq PERSON
   FEMALE subseteq PERSON
4) STUDENT subseteq not PROFESSOR
5) Exists isFriendOf. T subseteq PERSON
   Exists isFriendOf^-. T subseteq PERSON
6) Exists studiesWith. T subseteq STUDENT
   Exists studiesWith^-. T subseteq STUDENT
7) studiesWith subseteq isFriendOf
8) PROFESSOR and Exists isSupervisorOf STUDENT subseteq ACTIVEPROFESSOR

9) PROFESSOR and Exists isSupervisorOf MALE and Exists isSupervisorOf FEMALE subseteq VERYACTIVEPROFESSOR

10) PROFESSOR and STUDENT subseteq SPECIALPROFESSOR

    SPECIALPROFESSOR subseteq PROFESSOR

    SPECIALPROFESSOR subseteq STUDENT

11) PROFESSOR and Exists isFriendOf PROFESSOR and Exists isFriendOf STUDENT