Surname:

First Name: _

INSTRUCTIONS This exam covers units 1-6 and is weighted with a maximum of 42 points (pt) from a total of 100 pt in the whole course (Unit 7 is not covered in the exam and weights 8 pt). For the test, use the original statement sheet and avoid corrections or unclear marking (ask for a new blank sheet if needed). Completion time = 2 hours.

- EXAM -

Exercise 1 (20pt). Each question may have $n \ge 1$ correct answers. For each question, the **total score** will be: Checking all correct answers = **5pt**; Checking only correct answers, but not all = **3pt**; Checking an incorrect answer = **-3pt**; Leaving blank = **0pt**. A total negative score in Exercise 1 counts as 0% in the rest of the exam.

1.1) Mark those formulas below that are tautologies in classical propositional logic:

$$\begin{array}{|c|c|c|} \square & p \lor q \leftrightarrow p \lor (\neg p \land q) \\ \square & p \lor q \leftrightarrow p \lor (\neg q \land p) \\ \square & (p \rightarrow p) \rightarrow p \\ \square & \neg (p \rightarrow \neg p) \end{array}$$

1.2) Mark those clauses that "occur in" (that is, can be derived from) the transformation of $p \to \neg(q \leftrightarrow r)$ into Conjunctive Normal Form (CNF)

$$\begin{array}{ccc} \Box & \neg p \lor q \lor r \\ \Box & \neg r \lor p \end{array} \qquad \begin{array}{ccc} \Box & \neg p \lor \neg q \lor r \\ \Box & \neg p \lor \neg q \lor \neg r \end{array}$$

1.3) Given the following logic program p:-not p,r. q:-not p.



1.4) Which of the following pairs form interpretations $\langle H, T \rangle$ that satisfy the formula $\neg p \rightarrow q$ in the logic of Here-and-There:

 Exercise 2 (5pt). A logic program contains an extensional database with facts for two predicates with the following meanings: teaches (P,C) = "professor P teaches course C"; enrolled (S,C) = "student S is enrolled in course C". Write a rule (without aggregates) to obtain in query(S) the students S enrolled in at least one course taught both by professor enrique and professor analia but in which student ana is not enrolled.

query(S) :-

Exercise 3 (5pt). A logic program is used to compute several answer sets with a predicate assigned(C,R,N) meaning that course C is assigned classroom R for N hours. Write a #maximize clause to maximize the total number of hours assigned to classroom 25.

Exercise 4 (12pt). A player of straight **poker** receives 5 cards at the beginning of the game. Write an ASP program that generates all possible initial hands (for a single player) with a **poker**, that is, four cards with the same rank x, plus a fifth card with a rank y different from x. We assume there are no jokers. Use predicate hand(R,S) meaning that we get a card with rank R for suit S. For instance hand(2,diamonds) means we got the 2 of diamonds.

suit(club;diamond;spade;heart).
rank(2..10;jack;queen;king;ace).

#show hand/2.