CENG424 - Homework 4

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1. The premises are given as follows:

   1. $Animal(Horse) \rightarrow \exists x.(groom(x, Horse) \wedge stableman(x))$
   2. $Plant(Horse) \rightarrow \neg\exists x.(groom(x, Horse) \wedge stableman(x))$

   goal. $Animal(Horse) \rightarrow \neg Plant(Horse)$
   negated goal. $\neg(Animal(Horse) \rightarrow \neg Plant(Horse))$

   Applying INSEADO to 1) to turn it into the clausal form:

   I - $\neg Animal(Horse) \vee \exists x.(groom(x, Horse) \wedge stableman(x))$
   E - $\neg Animal(Horse) \vee (groom(a, Horse) \wedge stableman(a))$
   D - $(\neg Animal(Horse) \vee groom(a, Horse)) \wedge (\neg Animal(Horse) \vee stableman(a))$
   O1 - $\{\neg Animal(Horse), groom(a, Horse)\}$
   O2 - $\{\neg Animal(Horse), stableman(a)\}$

   Applying INSEADO to 2) to turn it into the clausal form:

   I - $\neg Plant(Horse) \vee \neg\exists x.(groom(x, Horse) \wedge stableman(x))$
   N - $\neg Plant(Horse) \vee \forall x.(\neg groom(x, Horse) \vee \neg stableman(x))$
   A - $\neg Plant(Horse) \vee (\neg groom(x, Horse) \vee \neg stableman(x))$
   D - $\neg Plant(Horse) \vee \neg groom(x, Horse) \vee \neg stableman(x)$
   O - $\{\neg Plant(Horse), \neg groom(x, Horse), \neg stableman(x)\}$

   Applying INSEADO to the negated goal:

   I - $\neg(\neg Animal(Horse) \vee \neg Plant(Horse))$
   N - $Animal(Horse) \wedge Plant(Horse)$
   O1 - $\{Animal(Horse)\}$
   O2 - $\{Plant(Horse)\}$

   1. $\{\neg Animal(Horse), groom(a, Horse)\}$
   2. $\{\neg Animal(Horse), stableman(a)\}$
   3. $\{\neg Plant(Horse), \neg groom(x, Horse), \neg stableman(x)\}$
   4. $\{Animal(Horse)\}$
   5. $\{Plant(Horse)\}$
   6. $\{stableman(a)\}$ $2, 4$
   7. $\{\neg Plant(Horse), \neg groom(a, Horse)\}$ $3, 6\ \{x \leftarrow a\}$
   8. $\{\neg groom(a, Horse)\}$ $5, 7$

9. $\{\neg Animal(Horse)\}$ $1, 8$
10. $\{\}$ $4, 9$

2. a)
   1. $\{T\}$ *premise*
   2. $\{\neg S, \neg T, \neg R\}$ *premise*
   3. $\{\neg T, R\}$ *premise*
   4. $\{S, \neg R\}$ *premise*
   5. $\{R\}$ $1, 3$
   6. $\{S\}$ $4, 5$
   7. $\{\neg T, \neg R\}$ $2, 6$
   8. $\{\neg R\}$ $1, 7$
   9. $\{\}$ $5, 8$

   b)
   1. $\{T\}$ *premise*
   2. $\{\neg S, \neg T, \neg R\}$ *premise*
   3. $\{\neg T, R\}$ *premise*
   4. $\{S, \neg R\}$ *premise*
   5. $\{\neg T, \neg R\}$ $2, 4$
   6. $\{\neg T\}$ $3, 5$
   7. $\{\}$ $1, 6$

   c)
   1. $\{T\}$ *premise*
   2. $\{\neg S, \neg T, \neg R\}$ *premise*
   3. $\{\neg T, R\}$ *premise*
   4. $\{S, \neg R\}$ *premise*
   5. $\{R\}$ $1, 3$
   6. $\{S\}$ $4, 5$
   7. $\{\neg S, \neg R\}$ $1, 2$
   8. $\{\neg S\}$ $5, 7$
   9. $\{\}$ $6, 8$

3. 1. $\{P, R, \neg Q\}$ *premise*
   2. $\{\neg P, R\}$ *premise*
   3. $\{\neg R, \neg Q\}$ *premise*
   4. $\{Q\}$ *premise*
   5. $\{R, \neg Q\}$ $1, 2$
   6. $\{\neg Q\}$ $3, 5$
   7. $\{\}$ $4, 6$