CSE-6490B
Final Exam

"Assignment # 4"

This is open-notes. It is out of a total of 20 points, and has the same weight as each assignment.

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1. (5 points) **Expressiveness.** *Express yourself!* [Short Answer]

   a. One could, albeit with much effort, code up chess via the *win* and recursion-through-negation like we did for the *stones* game in class.

   If our chess program is locally stratified, then this means that there is a perfect model, and everything is assigned *true* or *false*. This means *win* (*"beginning board state"*)is either *true* or *false*. So it would be known that white (the first player) could always win playing a perfect game *or* that black (the second player) could always win playing a perfect game.

   Does this mean that a game of chess is necessarily winnable by the perfect white player or the perfect black player? Why or why not?

   b. Are there any types of queries that can be expressed in SQL but not Datalog?

   c. Are there any types of queries that can be expressed in SQL but not Datalog¬? (Careful.)

   d. Is Datalog a superset of first-order predicate calculus (logic)? Why or why not?

   e. Is Datalog¬ interpreted under negation-as-finite-failure, the well founded semantics, or the stable model semantics a subset of first-order predicate calculus (logic)? Why or why not?

2. (5 points) **XML & XPath.** *Extra marks longed for.* [Analysis]

   Consider an XML document of size N, so with a size on the order of $\mathcal{O}(N)$. That is, printing it in any reasonable way would take $\mathcal{O}(N)$ bytes.

   Assume each element in the document is size $\mathcal{O}(1)$, not counting the content and sub-trees of the element. Assume each element has $\mathcal{O}(1)$ attributes, each of size $\mathcal{O}(1)$.

   An XPath query on the document returns a *list* of the nodes extracted from the XML document that match the query.

   a. (2 points) What is the length of the list resulting from the XPath query '//*' applied to the document?

   b. (2 points) What is the *size* of the results in total from the XPath query '//*' applied to the document? Consider the worst case.

   c. What is the *size* of the results in total from the XPath query '//*/@*' applied to the document? Consider the worst case.

3. (5 points) **Semantic Web.** *The web means so much to me.* [Short Answer / Essay]

   a. What might *ontologies* offer that traditional *schema* do not?

   b. (2 points) What does OWL stand for? What functionality does OWL offer?

   c. (2 points) Compare and contrast XML and RDF Databases. What functionality does RDF provide, if any, that is different than what XML already provides? And, vice-versa, what functionality does XML provide, if any, that is different than what RDF provides? Keep your answer to under 300 words.

4. (5 points) **Readings.** *Just like a simile!* [Analogy]

   For each of the following, come up with a good answer for the *analogy*. For example, consider

   relational database : SQL :: XML document : _____

   This is to be read as "relational database *is to* SQL *as* XML *is to* _____." A good answer here is "XQuery". Why? A relational database is a collection of data that can be queried with the query language SQL. An XML document is a collection of data that can be queried with the query language XQuery.

   In each case, you may write a brief—one or two sentence—explanation behind your choice, if you feel it is needed.

   a. Oracle Real Application Cluster Database : shared disks :: Bigtable : _____
   b. MapReduce : _____ :: SQL : aggregation
   c. SQL query : B+ tree :: XPath expression : _____
   d. enterprise information integration : _____ :: run-time : compile-time
   e. _____ : security :: transaction management : isolation