Advanced Web Technologies
academic year 2011-12

Rules

- This is a closed books exam.
- The operation of any electronic device is prohibited (e.g, no calculator, phone or PDA).
- Answer the questions being *precise, complete,* and *formal*.
- Write as *clearly* as possible, both in terms of handwriting and wording.

Questions

1. (a) Draw one graph with at least six and at most ten nodes, such that:
   - It has average path length between 1.5 and 2
   - It has a node of degree 3
   - It contains no cliques
   (b) Consider the directed graph in Figure 1, provide:
   - i. The **H** matrix representation of the graph
   - ii. The PageRank at iteration two π_2^T without adjustments, i.e., $\pi_2^T = \pi_0^T \mathbf{HH}$
   - iii. The stochastically adjusted matrix **S**, and the Google matrix **G** (supposing $\alpha = 0.75$)
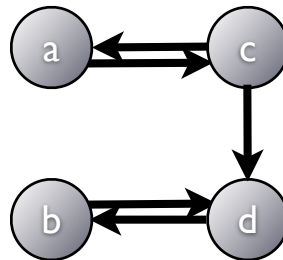   - iv. Consider removing the edge from c to d. What will happen to the PageRank with $\alpha = 1$?

Figure 1: A directed graph.

2. Compare Model-View-Controller and View-First approaches to web development.

3. Make a comparison between Amazon and Google as cloud platform providers, with the list of pros and cons for both of them.

4. What is the difference between CP and AP (in terms of the CAP theorem)? Provided with a replication strategy for some arbitrary database, how to find out if the database with the given replication strategy is CP or AP? What should you pay your attention to?

5. What is an ontology? What kind of approaches for describing ontologies do you know?

6. What kind of problems you may encounter when you integrate business processes that span across different organizations? How will you test it? Why traditional testing techniques do not work well for such scenarios?

7. Describe the concept of asynchronous request handling (e.g., Jetty Continuations). Provide an example where async request handling is useful.

8. Describe a general idea of the MapReduce framework. How would you solve the following problem, using MapReduce? You have a list of documents, each document contains personal details of one of the users of your application. Among the details is the city where a user lives. You want to obtain a list of cities where at least 10000 users live, another list of cities, where less than 10000, but at least 1000 users live, and the third list of cities, where less than 1000 users of your application live. (Hint: You may need to use two MapReduce steps)