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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 \mathbf{H} matrix representation of the graph
 - ii. The PageRank at iteration two π_2^T without adjustments, i.e., $\pi_2^T = \pi_0^T \mathbf{H} \mathbf{H}$
 - iii. The stochastically adjusted matrix \mathbf{S} , and the Google matrix \mathbf{G} (supposing $\alpha = 0.75$)
 - iv. Consider removing the edge from c to d. What will happen to the PageRank with $\alpha = 1$?

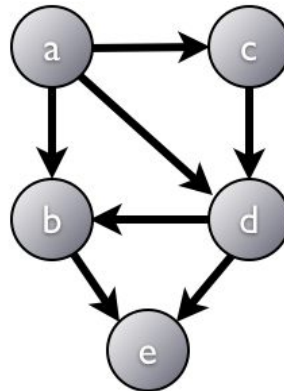


Figure 1: A directed graph.

2. Describe different AJAX usage scenarios (e.g., traditional AJAX, COMET). Compare JSON and XML as it comes to using it as a data format for AJAX.
3. What is “session” (local) consistency? What are its strengths and limitations?
4. What is “eventual consistency”? How does it affect Amazon (or Google, pick either of them) cloud services implementations (SimpleDB, S3, SQS)?
5. Provide a description of document-oriented databases. What are the difference between them and traditional (relational) databases? What are pro et contra of document-oriented databases?
6. Describe the Paxos algorithm. Show how Paxos behaves when it receives two conflicting requests through two proposers.
7. Describe REST as a protocol for accessing web services.
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 a technical specification of a smart device. Among the details it also provides a company name that has produced the device. You want to obtain a list of companies that produced at least 1000 devices; another list of companies, with less than 1000, but at least 100 devices produced; and the third list of companies with at least 10 produced devices.