Name_____ Lastname_____ Student number | | | | | | | |

Advanced Web Technologies
academic year 2008-09

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. Consider the directed graph in Figure 1 and give:
   (a) The average indegree, outdegree, and degree
   (b) The diameter
   (c) The path from a to d
   (d) The $\mathbf{H}$ matrix representation of the graph
   (e) The PageRank at iteration two π_2^T without adjustments, i.e., $\pi_2^T = \pi_0^T \mathbf{H}\,\mathbf{H}$
   (f) The stochastically adjusted matrix $\mathbf{S}$, and the Google matrix $\mathbf{G}$ (supposing $\alpha = 0.8$)
   (g) Add or remove one (and only one) link in the graph with the goal of obtaining the maximum increase of the PageRank of node a. Provide explanations for the choice made.

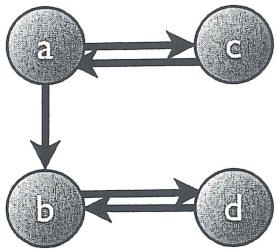

Figure 1: A directed graph.

2. Consider the concept of an ontology in Computer Science.
   (a) Define the concept.
   (b) What are ontologies good for?
   (c) Statement in ontologies involve instances, classes and relations. Give examples of different kinds of statements, and indicate thier meaning (using predicate logic or set theory).
3. Consider applying PageRank to an undirected graph. Does it make sense? What would happen to the Google Matrix $\mathbf{G}$ and to the $\mathbf{H}$ matrix? Consider the undirected version of the graph in Figure 1 to illustrate the answer.
4. Define Grid computing and describe its role in the context of the past and present Web.
5. In a room there are four devices able to communicate and to compute. There are two temperature sensors, one humidity sensor and a heater. In this scenario provide the following Web service definitions.[1]
   (a) Provide WSDL definitions for each device describing at least one operation and one message.
   (b) Provide BPEL description of the following process: measure concurrently the temperature from one of the two temperature sensors and the humidity and then decide whether to turn on the heating or not.
   (c) Describe in BPEL and in natural language another process of your choice (you can add devices and WSDL descriptions, if necessary).

[1] Precise usage of XML syntax for WSDL and BPEL is not necessary and syntax mistakes will not be evaluated.