Algorithms – CS-27200/37000 Homework – March 3, 2004

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ADVICE. Take advantage of the TAs' office hours Monday, Tuesday and Thursday 5–6pm in the Theory lounge (Ry–162).

DATES TO REMEMBER. Mon Mar 8: Midterm 2. Fri Mar 12: **Last class. ATTENDANCE REQUIRED.** Review for final exam. Mon Mar 15, 10:30–12:30: Final Exam

READING. Floyd-Warshall algorithm (all pairs shortest path, transitive closure.) (Text, pp. 629-635.)

GRADUATE READING. Depth-first search (DFS). (Classification of the edges by DFS. The "white-path theorem.") Topological sort.

18.1 The Longest path problem is defined as the set of pairs LONG = $\{(G, k) : G$ is a graph and G has a path of length $\geq k\}$. A graph is Hamiltonian if it has a Hamilton cycle (a cycle passing through all vertices.) HAM is the set of Hamiltonian graphs. Use the fact that HAM $\in$ NPC to prove (a) (5 points) that LONG is NP-hard; (b) (G only, 6 points) LONG $\in$ NPC. If you solve (b), you also get a partial credit (3 points) toward (a). To get the full credit for (a), you need to give a vevry simple solution to (a).

18.2 (a) (4 points) Give a Karp-reduction from 3-COL to HALTING. (b) (G only, 5 points) Prove that no Karp-reduction from HALTING to 3-COL exists.