

**Problem 5 on the final exam, 22C:253, fall 2004** The PARTIAL VERTEX COVER problem (PVC) takes as input a vertex weighted graph  $G = (V, E)$ ,  $w : V \rightarrow Q^+$ , and an integer  $p \geq 0$ . The problem is to find a subset of vertices with smallest weight that cover (some)  $p$  edges.

1. Write down the LP relaxation for this problem and the dual of this relaxation.
2. Use the primal-dual framework to obtain a factor-4 approximation algorithm for this problem.