Neha Maddali

Homework 3 –1

1) (50 points) Derive the I/O costs of different join algorithms of relations R and S given the following variables, which you may or may not use all of them. Suppose that there is 1 page of results for the join. Ignore the CPU time cost. Please write down steps to explain your answer for full credits.

   |R|=20: Number of tuples per page in R
   |S|=20: Number of tuples per page in S
   M=120: Number of pages in R
   N=40: Number of pages in S
   B=10: Number of available main memory in pages

   a) (10 points) What is the minimal I/O cost of block nested loop join?
      Use R as the outer relation.
      Total cost = M + [M/(B-2)]*N = 120 + (120 / (10-2)) * 40 = 720

      Use S as the outer relation.
      Total cost = N + [N/(B-2)]*M = 40 + (40 / (10-2)) * 120 = 640 --> minimal cost

   b) (10 points) What is the minimal I/O cost of simple nested loop join?
      Use R as the outer relation
      Total cost = $M+M*P_R*N$ = 120 + 120 * 20 * 40 = 96,120

      Use S as the outer relation
      Total cost = $N+N*P_S*M$ = 40 + 40 * 20 * 120 = 96,040 --> minimal cost

   c) (10 points) What is the minimal I/O cost of indexed nested Loops Join? (Suppose the cost of retrieving a matching tuple is 3, for both R and S)
      Use R as the outer relation
      Total cost = $M+M*P_R$*(cost of retrieve) = 120 + 120 * 20 * 3 = 7,320

      Use S as the outer relation
      Total cost = $N+N*P_S$*(cost of retrieve) = 40 + 40 * 20 *3 = 2,440 --> minimal cost

   d) (10 points) What is the minimal I/O cost of grace hash join?
      Each partition fits in the B-2 pages
      I/O cost for a read and write is the same
      Ignore the cost of writing the join results
      Total cost = 3*(120 + 40) = 480

   e) (10 points) What is the minimal I/O cost of Sort-Merge Join? (Suppose the join is on their primary keys which are sorted already)
      Total cost = M+N = 120 + 40 = 160

Submission Instruction

Please use Microsoft Words or other tools to type your answer. Don't handwrite. Submit your work in pdf through your Canvas account.