Date:
Name 1:
Name 2:

Assume you have a relation R(a,b,c). Suppose the blocks can hold either 10 tuples (heap) or 100 search keys (b+tree index). Nodes of the index are 70% full. The relation contains 1 million records. The values of a are expected to be >=0 and < $10^{6.}$

Consider the following two queries:

a) $\sigma_{a=5}R$
b) $\sigma_{a>=10,000 \text{ and } a < 20,000} R$

1. Determine for each query:
   - the number of expected matching records

2. Determine, for each of the structures below:
   i) Expected number of leaf blocks of each index
   ii) The expected height of each index
   iii) The average number of disk I/Os needed to answer each query

Assume that nothing is in memory initially, and that the search key is the primary key of the table.

a) The B+tree is dense and the heap is unsorted
b) The B+tree is a sparse.

Redo assuming that a is not a primary key, values of a vary from >=0 and <= 10^5