1. Explain how to insert, delete, and search a record
   a. in heap file
   b. in sorted file
2. Considering B+ tree with the following parameters
   Size of one data entry = 20 bytes;
   Page size=4096 bytes; 96 bytes are reserved for bit map
   Total number of records = 100,000; record size = 40 bytes
   a. If the B+ tree is dense and unclustered, what is the I/O cost for a range select with Reduction Factor = 0.1?
   b. If the B+ tree is sparse, what is the I/O cost for a range select with Reduction Factor = 0.1?
   c. If the B+ tree is dense and clustered, what is the I/O cost for a range select with Reduction Factor = 0.1?
3. Design pseudo code for
   a. Block nested loop join
   b. Grace hash join
   c. Multi-way merge sort join
4. Consider the following relations: Technicians(SSN, name, address, phone_number), Tests(FAAid, name, max_score), Planes(Pid, model), and Examine(SSN, FAAid, Pid, date, score). For each of the following queries, write a relational algebraic expression and draw relational algebraic tree with selection and projection conducted as early as possible.
   a. Find the names of the technicians who examines the same plane on 2/10/2019 and 2/11/2019
   b. Find the date that at least one Boeing 747 plane got full scores in its tests
   c. Find the name and ssn of the technicians who haven't conducted any test on any Boeing 747 plane before "2/10/2019"
5. How many left-deep plans are there for joining all four tables in question 5 without cross product? What are they? (hint: if two tables do not have a common attribute, then natural join is defined as cross product).