Advanced Topics in Databases
Exercise 1

1. [Group 1] Compare disk-based DBMSs and main-memory DBMSs! What advantages and disadvantages emerge using main memory as primary storage?

2. [Group 1] What is the reason for the main-memory access bottleneck? Why is the main-memory access bottleneck a problem in main-memory DBMSs, but not that important in traditional disk-based DBMSs? How can the main-memory access bottleneck be addressed?

3. [Group 2] Which of these database algorithms benefit from spatial and/or temporal locality?
   - Block Nested Loop Join
   - Merge Join on sorted Tables
   - Full-Table Scan
   - Range Selection using a B+-Tree
   - Hash-based Aggregation

4. [Group 3] What is the memory hierarchy? How is it used during memory access? Describe the basic principle behind caches?

5. [Group 3] Name and explain three approaches for block placement within caches. What are their advantages and disadvantages?

6. [Group 4] For each of the following scenarios, name the best block placement strategy. Explain why it is the best.
   - minimal amount of cache line evictions
   - minimal search cost for a cache line
   - very small caches
   - accessed memory addresses are evenly distributed
   - accessed memory addresses are skewed, but minimal search cost is needed
7. [Group 5] Explain the terms poor data locality and poor code locality with respect to the traditional processing model (tuple-at-time processing) using the following query plan.

![Query Plan Diagram]

Good Luck!