1. Give a disadvantage of:
   (a) Mapped files? (5 points)
   (b) Partial subblocking? (5 points)
   (c) Using the valid bit to replace a missing page reference bit? (5 points)

2. Consider a cache managed by an ARC replacement policy and assume that the size of T1 is lesser than target_T1. Which actions will be taken by the ARC policy when the cache is full and the next cache miss is caused by a page that is
   (a) Neither in B1 nor in B2? (5 points)
       ARC will expel the least frequently referenced page from __T1__ __T2__.
       It will __ increase target_T1 __ decrease it __ leave it unchanged.
   (b) In B2? (5 points)
       ARC will expel the least frequently referenced page from __T1__ __T2__.
       It will __ increase target_T1 __ decrease it __ leave it unchanged.

3. Describe in some detail the page replacement policy of Mach (10 points minus 4 points if no diagram) and explain its main advantage and main disadvantage over the VMS page replacement policy (2×5 points)

4. Why did Babaoglu and Joy introduce the vfork() system call? (5 points) Why did it never replace the fork() system call? (5 points)

5. What is false sharing? (5 points) What problem does it cause in a DSM? (5 points) How does Munin address this issue? (5 points)

6. How does Mach implement threads? (5 points)

7. Why does the Fast File System subdivide each disk partition into cylinder groups? (5 points)

8. Unlike Windows, UNIX typically merges all its disk partitions into a single directory hierarchy. What is the main advantage of this approach? (5 points) Which mechanism does UNIX use to implement it? (5 points)

9. What would be the best page table organization for a virtual memory system with a 4 KB page size and a TLB that uses complete subblocking with a subblocking factor of 2. (10 points including 5 points for a detailed drawing of a page table entry).