Computer Operating Systems

Problem#1

Define a semaphore. Describe two operations that are defined for semaphores. Define atomicity of operations. Define the mutual exclusion (critical section) problem. Describe (provide pseudocode for) a semaphore-based solution to the mutual exclusion problem.

Problem #2

Explain page replacement in a virtual memory organization. Motivate the need for an efficient page replacement algorithm. Define the optimal page replacement algorithm (OPT). Explain why it is not used in practice. Name and describe the operation of the practical algorithm that approximates the behavior of OPT.

Problem#3

Define block, sector, track and cylinder. Explain why application programs usually access the disk through the operating system rather than directly. Motivate why it is necessary to keep track of free (unallocated) disk blocks. Describe two allocation methods:
free block list and bit vector. Compare their relative advantages and disadvantages.