1 Heap Memory Management

Consider a memory partition of 100 kB, 400 kB, 200 kB, and 500 kB blocks (in this order), how would the following sequence of memory requests:

\[ 200 \text{ kB}, 380 \text{ kB}, 100 \text{ kB}, 10 \text{ kB} \]

be served using

a) First fit
b) Best fit
c) Worst fit.

2 Page Tables

Consider a system in which the virtual address space is 64 bit, the page size is 4kB, and assume that an entry of a page table requires 4 bytes. The total amount of physical memory in the system is 1GB.

a) How much space would a simple single-level page table take?

b) How many levels would a multi-level page table need if we wanted to ensure that every individual page table fits into a single page of memory?

c) How many page table entries does an inverted page table need to have?
3 Page Replacement

Assume the following trace of page requests:

\[ a, b, c, d, a, b, e, a, b, c, d, e \]

How many page faults are generated using

a) a page cache of size 3 page frames and FIFO replacement policy,

b) a page cache of size 4 page frames and FIFO replacement policy,

c) a page cache of size 4 page frames and clock replacement policy.