

8.1

Explain the difference between internal and external fragmentation.

In a dynamic memory allocation system, when free memory blocks are too small to the capacity of requests, fragmentations occur.

Internal fragmentation:

When the memory allocated is larger than required, the rest is wasted.¹

External fragmentation:

The inability to use free memory as the free memory is divided into small blocks of memory and these blocks are interspersed with the allocated memory.²

8.3

Given five memory partitions of 100KB, 500KB, 200KB, 300KB, and 600 KB (in order), how would each of the first-fit, best-fit, and worst fit algorithms place processes of 212KB, 417KB, 112KB, and 426KB (in order)? Which algorithm makes the most efficient use of memory?

- First-fit:
212KB in 500KB piece, 417KB in 600KB piece, 112KB in 500KB piece (free space), 426KB pending.
- Best-fit:
212KB in 300KB piece, 417KB in 500KB piece, 112KB in 200KB piece, 426KB in 600KB.
- Worst-fit:
212KB in 600KB piece, 417KB in 500KB piece, 112KB in 600 piece (free space), 426KB pending.

Best-fit is the most efficient.

¹Excerpt from Wikipedia.

²Excerpt from Wikipedia.

8.9

Consider a paging system with the page table stored in memory.

- a. If a memory reference takes 200 nanoseconds, how long does a paged memory reference take?
- b. If we add TLBs, and 75 percent of all page-table references are found in the TLBs, what is the effective memory reference time?

a. $200\text{ms} + 200\text{ms} = 400\text{ms}$

b. $200\text{ms} \times 0.75 + 400\text{ms} \times 0.25 = 250\text{ms}$

8.12

a. $219 + 430 = 649$

b. $2300 + 10 = 2310$

c. invalid.

d. $1327 + 400 = 1727$

e. invalid.

References

1. [https://secure.wikimedia.org/wikipedia/en/wiki/Fragmentation_\(computer\)](https://secure.wikimedia.org/wikipedia/en/wiki/Fragmentation_(computer))