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Homework 7

**7.9**

Internal fragmentation is the space inside a process that is wasted because of restrictions on the size of memory blocks. Allocated memory may be slightly larger than requested memory due to the overhead associated with tracking the various blocks. This size difference is memory internal to a partition that is not being used.

External fragmentation happens when a dynamic memory allocation allocates some memory, leaving behind a small piece that can't be effectively used. If too much external fragmentation occurs, the amount of usable memory is drastically reduced. In certain scenarios, you may have enough total memory space for a process, but it cannot be allocated to that process because it is not contiguous.

**7.11**

| Process | 212KB proc | 417KB proc | 112KB proc | 426KB proc |
|---|---|---|---|---|
| First-fit | 500KB | 600KB | 288KB | Must wait |
| Best-fit | 300KB | 500KB | 200KB | 600KB |
| Worst fit | 600KB | 500KB | 300KB | Must wait |

Best-fit is the most efficient use of memory.

**7.12**

a. Contiguous memory allocation — might require relocation of the entire program since there's not enough space for the program to grow its allocated memory space. Process may need to be moved to new memory location if there's not enough space for the process to grow its allocated memory space.
b. Pure segmentation — Segment may need to be moved to new address since there's not enough space for the segment to grow its allocated memory space.
c. Pure paging — New pages can be allocated incrementally to a process without the need of moving the process in memory.

**7.17**

| | Address Refs | Page | Offset |
|---|---|---|---|
| a. | 2375 | 1 | 327 |
| b. | 19366 | 18 | 934 |
| c. | 30000 | 29 | 304 |
| d. | 256 | 0 | 256 |
| e. | 16385 | 16 | 1 |

**7.18**

a. 2^5+2^10 = 15 bits.
b. 2^4+2^10 = 14 bits.

**7.19**

a. 12-bit offset. 2^32 / 2^32 = 2^20 entries.
b. 1 page = 1 frame. 20 bits/2 = 10. 2^17 entries.

**7.23**

| Segment | Base | Length |
|---|---|---|
| 0 | 219 | 600 |
| 1 | 2300 | 14 |
| 2 | 90 | 100 |
| 3 | 1327 | 580 |
| 4 | 1952 | 96 |

a. 0,430 : 219 + 430 = 649
b.  1,10 : 2300 + 10 = 2310
c. 2,500 : illegal reference, trap to operating system
d. 3,400 : 1327 + 400 = 1727
e. 4,112 : illegal reference, trap to operating system