

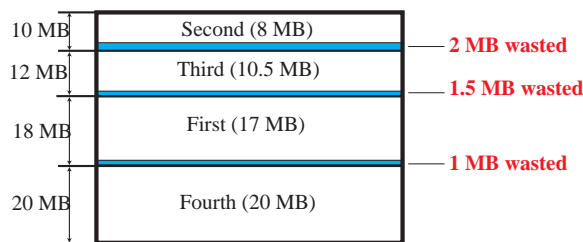
# CHAPTER 7

## Operating Systems

(Solutions to Practice Set)

2. Components of an operating systems are user interface, memory manager, process manager, device manager, and file manager.
4. In partitioning, memory is divided into variable-length sections, each of which holds one complete program. In paging, memory is divided into much smaller fixed-length sections as is the program itself; the program does not have to be contiguous in memory.
10. Deadlock happens when processes are all waiting for resources held by other processes: they are all waiting for each other. This happens when the operating system does not put resource restrictions on processes. Starvation happens when the operating system puts too many resource restrictions on a process. If a process must wait until it can get all of the resources that it needs before it starts to execute, it may never start.
12. a      13. b      16. a      18. a      19. d
23. a      27. d      28. a
31.  $64 - 4 = 60$  MB.
34. Figure S7.34 shows the partitions and memory used by each program.

**Figure S7.34** Exercise 34



Total memory used =  $17 + 8 + 10.5 + 20 = 55.5$  MB.  
Total memory wasted =  $2 + 1.5 + 1 = 4.5$  MB.  
Percent memory wasted =  $4.5 / 60 \times 100 = 7.5\%$ .

36.

- a.  $13 / 4 = 3.25 \rightarrow 4$  pages.
- b.  $12 / 4 = 3$  pages.
- c.  $27 / 4 = 6.75 \rightarrow 7$  pages.
- d.  $15 - (4 + 3 + 7) = 1$  frame.
- e. Not considering memory lost inside each frame, one frame (4 MB) is unused.
- f.  $(4 / 60) \times 100 = 6.66\%$ .

38.

- a. running
- b. ready
- c. ready
- d. waiting
- e. waiting