OS Problem Sheet #7

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Problem 7.1: *positioning algorithms*

a)

Best-fit Algorithm							
	12KiB	5KiB	19KiB	13KiB	7KiB	8KiB	16KiB
14KiB:							14KiB
9KiB:	9KiB						
7KiB:					7KiB		
10KiB:				10KiB			
Result	3KiB	5KiB	19KiB	3KiB	0KiB	8KiB	2KiB

b)

Worst-fit Algorithm							
	12KiB	5KiB	19KiB	13KiB	7KiB	8KiB	16KiB
14KiB:			14KiB				
9KiB:							9KiB
7KiB:				7KiB			
10KiB:	10KiB						
Result	2KiB	5KiB	5KiB	4KiB	7KiB	8KiB	7KiB

c)

First-fit Algorithm							
	12KiB	5KiB	19KiB	13KiB	7KiB	8KiB	16KiB
14KiB:			14KiB				
9KiB:	9KiB						
7KiB:				7KiB			
10KiB:							10KiB
Result	3KiB	5KiB	5KiB	4KiB	7KiB	8KiB	6KiB

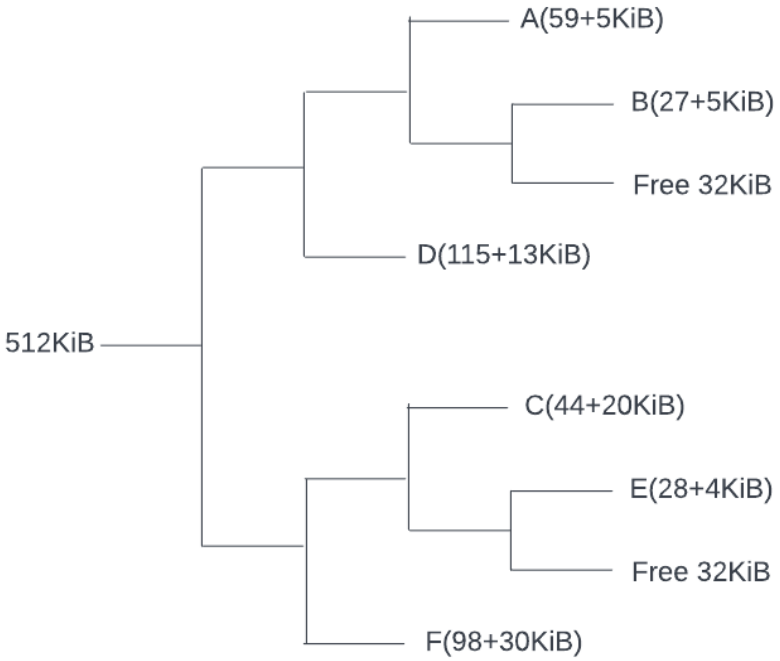
d) D

Next-fit Algorithm							
	12KiB	5KiB	19KiB	13KiB	7KiB	8KiB	16KiB
14KiB:			14KiB				
9KiB:				9KiB			
7KiB:					7KiB		
10KiB:							10KiB
Result	12KiB	5KiB	5KiB	4KiB	0KiB	8KiB	6KiB

Problem 7.2: *buddy system*

a)

512KiB						
A:59+5	B:27+5	C:44+20	D:115+13	E:28+4	F:98+30	32+32
64KiB	32KiB	64KiB	128KiB	32KiB	128KiB	64KiB



b) Overall Internal Fragmentation = 5 + 5 + 20 + 13 + 4 + 30 = 77KiB

c) A subsequent allocation G with 132KiB would require 256KiB(2^8) to be allocated, but the remaining segments are 128KiB and two 32KiB, hence allocation G would not be able to be accommodated.

Problem 7.3: *page replacement algorithms*

a) First In First Out (FIFO)

reference string	1	2	3	4	1	1	4	2	1	2
frame 0	1	1	3	3	1	1	1	1	1	1
frame 1		2	2	4	4	4	4	2	2	2
faults	X	X	X	X	X	✓	✓	X	✓	✓

Page Faults = 6

reference string	1	2	3	4	1	1	4	2	1	2
frame 0	1	1	1	4	4	4	4	4	4	4
frame 1		2	2	2	1	1	1	1	1	1
frame 2			3	3	3	3	3	2	2	2
faults	X	X	X	X	X			X		

Page Faults = 6

b) Belady's Optimal (BO)

reference string	1	2	3	4	1	1	4	2	1	2
frame 0	1	1	3	3	1	1	1	1	1	1
frame 1		2	2	4	4	4	4	2	2	2
faults	X	X	X	X	X			X		

Page Faults = 6

reference string	1	2	3	4	1	1	4	2	1	2
frame 0	1	1	1	4	4	4	4	4	4	4
frame 1		2	2	2	1	1	1	1	1	1
frame 2			3	3	3	3	3	2	2	2
faults	X	X	X	X	X			X		

Page Faults = 6

c) Least Recently Used (LRU)

reference string	1	2	3	4	1	1	4	2	1	2
frame 0	1	1	3	3	1	1	1	2	2	2
frame 1		2	2	4	4	4	4	4	1	1
faults	X	X	X	X	X			X	X	

Page Faults = 7

reference string	1	2	3	4	1	1	4	2	1	2
frame 0	1	1	1	4	4	4	4	4	4	4
frame 1		2	2	2	1	1	1	1	1	1
frame 2			3	3	3	3	3	2	2	2
faults	X	X	X	X	X			X		

Page Faults = 6