CSC 4420
Assignment 3
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7/15/2024

Assignment 3:

Question 1 (8 points): Given six memory partitions of 300 KB, 600 KB, 350 KB, 200 KB, 750 KB, and 125 KB (in order), how would the first-fit, best-fit, and worst-fit algorithms place processes of size 115 KB, 500 KB, 358 KB, 200 KB, and 375 KB (in order)? NOTE: After allocating a process to a memory partition, you have to calculate the remaining memory of that partition to be used for the rest of the processes.

Table 1-1: Memory Partitions and Processes in order so I can remember what I am supposed to be doing.

Memory Partition (KB)	300	600	350	200	750	125
Processes	115	500	358	200	375	

Table 1-2: Type of process and assigned memory partition for each process depending on algorithm.

Processes	115	500	358	200	375
First-Fit	300	600	750	350	NO REMAINING PARTITIONS AVAILABLE TO FIT.
Best-Fit	125	600	750	200	NO REMAINING PARTITIONS AVAILABLE TO FIT
Worst-Fit	750	600	NO PARTITION REMAINING LARGE ENOUGH	350	NO PARTITIONS REMAINING LARGE ENOUGH TO FIT

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Question 2 (8 points): Assuming a 1-KB page size and a 32-bit CPU (i.e., each logical and physical address is 32-bit long), what are the page numbers and offsets for the following logical address references (provided as decimal numbers)? To get points, you must show how you obtain the page number and offset from the binary version of each logical address. Then convert the found binary page number and offset to decimal.

a) 3085
b) 42095
c) 215201
d) 650000
e) 2000001

The page size is 1kb = 1024 bytes = > log2(1024) = 10 bits needed to address every byte within a page. ,Therefore the offset size is 10 bits.
The next steps are to: convert the decimal address to binary, pad the new binary number to 32 bits (the size of the cpu) to get the page number, with the offset being the values of digits 1-10. Then converting both the page number and offset into decimal once again.

A.) 3085
Converted into binary: 110000001101

32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Page Number:																						Offset:									
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	1	0	1
Page Number Decimal:																						Offset Decimal:									
3																						13									

B.) 42095
Converted into binary: 1010010001101111

32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Page Number:																						Offset:									
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0	0	0	1	1	0	1	1	1	1
Page Number Decimal:																						Offset Decimal:									
41																						111									

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C.) 215201

Converted into binary: 110100100010100001

32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Page Number:																						Offset:									
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	1	0	0	0	1	0	1	0	0	0	0	1
Page Number Decimal:																						Offset Decimal:									
210																						161									

D.) 650000

Converted into binary: 10011110101100010000

32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Page Number:																						Offset:									
0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1	0	1	0	1	1	0	0	0	1	0	0	0	0
Page Number Decimal:																						Offset Decimal:									
634																						784									

E.) 2000001

32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Page Number:																						Offset:									
0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1
Page Number Decimal:																						Offset Decimal:									
1953																						129									

Question 3 (6 points): Consider the following segment table:

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

Show the result of address binding for the following logical addresses:

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a) 0,430
b) 1,10
c) 2,500
d) 3,400
e) 4,112

Logical Address (Segment Number, Offset)		Corresponding Segment	Corresponding Segment Base	Corresponding Segment Length	Offset Less Than Length?	Physical Address = Offset + Corresponding Segment Base
0	430	0	219	600	TRUE	649
1	10	1	2300	14	TRUE	2310
2	500	2	90	100	FALSE	INVALID -590
3	400	3	1327	580	TRUE	1727
4	112	4	1952	96	FALSE	INVALID -2064

If it is false that the offset is less than the length, it means that the logical address is outside of the allotted segment length, which means there is no valid physical address within the segment. This means for c and e the physical address is invalid.

Question 4 (3 points): Explain the difference between internal and external fragmentation.

Internal fragmentation occurs when memory is not fully used due to the storage allocation being larger than the data size for that location. By comparison, external fragmentation occurs when there is memory available, but due to the fragmentation of the memory blocks, the memory blocks are too small for any memory to be stored there. Internal fragmentation and external fragmentation can therefore be thought of as two extremes of the same problem, the first where the unit of storage size is so large it is inefficient, and the second where the unit of storage size is so small as to be useless.