CIS 350 – INFRASTRUCTURE TECHNOLOGIES

IN-CLASS SMALL GROUP ACTIVITY #6

**Address translation under segmentation, paging, and segmentation and paging
(Translation of virtual addresses to physical addresses)**

Names of Group Members:
_____
_____

I. Logistics

    1. Get in group of 3 or 4.
    2. Discuss and complete the assignment together.
    3. Choose a recorder to prepare the final copy to hand in to instructor, one
       per group.
    4. Be sure all group members' names are on final copies. Do not add names of
       your classmates who missed this class and did not participate in the
       assignment.

II. Assignment

Each group will receive between 3 and 6 problems to work: address translation
under (1) segmentation, (2) paging, and (3) segmentation and paging.

In particular, your job has the following sections:

A. Allocate space for the program when it is loaded
    1. Find the memory space to use
    2. Create the appropriate segment or page tables

B. Perform address translation during I-time (Instruction time)
    1. Calculate the physical address from the virtual address under
        segmentation; paging; and segmentation and paging

    Note: Clarification on I-time. In the computer, instructions are
    executed in machine cycles. The machine cycle consists of I-time and
    E-time (Execution time). During I-time the instruction is fetched from
    memory to the instruction register. During E-time the instruction is
    executed. Address translation is performed during I-time before the
    instruction is executed. I-time works with virtual addresses, whereas
    E-time operates on physical addresses.

              HANDY CHART TO HELP WITH ADDRESSING

0K = 0	7K = 7168	14K = 14336
1K = 1024	8K = 8192	15K = 15360
2K = 2048	9K = 9216	16K = 16384
3K = 3072	10K = 10240	17K = 17408
4K = 4096	11K = 11264	18K = 18432
5K = 5120	12K = 12288	19K = 19456
6K = 6144	13K = 13312	20K = 20480

MEMORY MAP FOR SEGMENTATION

Start Address	Length	Status
0K	16K	1
16K	8K	0
24K	16K	1
40K	4K	0
44K	12K	1
56K	10K	0
66K	12K	1
78K	10K	0

PROBLEM 1
1. Load Program A - 3 segments: seg 0 = size 4K, 1=8K, 2=2K
2. Create Segment Table   _____
3. I-Time - Find the physical address of | 1 | 35 |
                                          ----
                                          seg# disp.

PROBLEM 2
1. Load Program B - 3 segments: seg 0 = size 8K, 1=4K, 2=4K
2. Create Segment Table   _____
3. I-Time - Find the physical address of | 0 |106 |
                                          ----
                                          seg# disp.

PROBLEM 3
1. Load Program C - 4 segments: seg 0 = size 4K, 1=4K, 2=2K, 3=4K
2. Create Segment Table   _____
3. I-Time - Find the physical address of | 3 |224 |
                                          ----
                                          seg# disp.

PROBLEM 4
1. Load Program D - 4 segments: seg 0 = size 8K, 1=4K, 2=6K, 3=10K
2. Create Segment Table   _____
3. I-Time - Find the physical address of | 2 |333 |
                                          ----
                                          seg# disp.

PAGE FRAME #	PROGRAM ID	PAGE NUMBER	STATUS
0	Operating Sys	0	1
1	Operating Sys	1	1
2	Operating Sys	2	1
3	Operating Sys	3	1
4	Program X	0	1
5	Program Y	0	1
6			0
7			0
8	Program X	1	1
9			0
10	Program X	2	1
11			0
12			0
13			0
14	Program Y	1	1
15			0

NOTE: Each frame is 4K, so the address of Page Frame #4 would be 16K (4K * Page Frame #)

PROBLEM 5
1. Load Program A - 14K
2. Create Page Table

3. I-Time - Find the physical address of

```
 _____
| 1  | 35 |
 ----------
page# disp.
```

PROBLEM 6
1. Load Program B - 11K
2. Create Page Table

3. I-Time - Find the physical address of

```
 _____
| 2  |106 |
 ----------
page# disp.
```

PROBLEM 7
1. Load Program C - 25K
2. Create Page Table

3. I-Time - Find the physical address of

```
 _____
| 5  |224 |
 ----------
page# disp.
```

PROBLEM 8
1. Load Program D - 17K
2. Create Page Table

3. I-Time - Find the physical address of

```
 _____
| 2  |333 |
 ----------
page# disp
```

PAGE FRAME TABLE FOR SEGMENTATION & PAGING

PAGE FRAME #	PROGRAM ID	SEGMENT NUMBER	PAGE NUMBER	STATUS
0	Operating Sys	0	0	1
1	Operating Sys	0	1	1
2	Operating Sys	1	0	1
3	Operating Sys	1	1	1
4	Program X	0	0	1
5	Program Y	0	0	1
6				0
7				0
8	Program X	0	1	1
9	Program X	1	0	1
10	Program X	1	1	1
11				0
12				0
13				0
14	Program Y	1	0	1
15				0
16	Program Y	1	1	1
17	Program X	2	0	1
18				0
19				0

NOTE: Each frame is 4K, so the address of Page Frame #4 would be 16K (4K * Page Frame #)

PROBLEM 9
1. Load Program A - 3 segments: seg 0 = size 4K, 1=8K, 2=2K
2. Create Page Table for Seg #1 only
3. I-Time - Find the physical address of

1	1	35

seg# page# disp.

PROBLEM 10
1. Load Program B - 3 segments: seg 0 = size 8K, 1=4K, 2=5K
2. Create Page Table for Seg #0 only
3. I-Time - Find the physical address of

0	1	106

seg# page# disp.

PROBLEM 11
1. Load Program C - 4 segments: seg 0 = size 4K, 1=4K, 2=12K, 3=4K
2. Create Page Table for Seg #2 only
3. I-Time - Find the physical address of

2	1	224

seg# page# disp.

PROBLEM 12
1. Load Program D - 4 segments: seg 0 = size 8K, 1=4K, 2=6K, 3=10K
2. Create Page Table for Seg #3 only
3. I-Time - Find the physical address of

3	2	333

seg# page# disp.