**CSE 4049: Design of Operating Systems**

**ASSIGNMENT 5:**

This assignment is designed to give you practice with concepts of

- Memory management Strategies

1. Given four memory partitions of 200k, 600k, 400k, 700k (in order). How would the First-fit, Best-fit, Worst-fit algorithms place processes of 312k, 517k, 212k, 526k (in order). Which algorithm makes the most efficient use of memory?

2. Using Page size of 16 bytes, a physical memory of 2048 byte and logical memory of 128 bytes,
   a) Find the number of bits required to represent logical address.
   b) Find the number of bits required to represent logical address.
   c) Find the number of entries in the page table.
   d) Find the total number of frames.
   e) Find the physical address of the logical address 20 with the following page table:

| |
|---|
| 8 |
| 6 |
| 5 |
| 2 |
| 3 |
| 1 |
| 4 |
| 7 |

3. How many number of pages are required for a process having size 8005 bytes with a page size of 200bytes?

4. With a Page size of 2048 bytes, find the amount internal fragmentation arises for storing a process of size72766 bytes.

5. Consider a machine with 64 MB physical memory and a 32-bit virtual address space. If the page size is 4KB, how many entries will be there in a conventional single level page table and in an inverted page table?

6. In paging scheme, if the page size is 2KB and process size is 83412 bytes. Then find the number of pages required and the size of internal fragmentation.

7. A specific editor has 200 K of program text, 15 K of initial stack, 50 K of initialized data, and 70 K of bootstrap code. If five processes are started simultaneously, how much physical memory is needed if shared program text is used?

8. If the hit ratio of a **Translation Look A-side Buffer** (TLB) is 80% and it takes 15 nanoseconds to search the TLB and 150 nanoseconds to access the main memory, what is the effective access time?

9. A Computer system implements 8 KB pages and a 32-bit physical address space. Each page table entry contains a valid bit, a dirty bit, three permission bits, and the frame numbers. If the maximum size of the page table of a process is 24 Kilobytes, Find the length of the virtual address supported by the system in bits.

10. Consider a byte addressable system with physical address space of 128 byte, Logical address space of 64 byte and a page size of 8byte. The page table is specified as follows

| |
|---|
| 4 |
| 5 |
| 1 |
| 3 |

a) Find the number of bits required to represent logical address.
b) Find the number of bits required to represent physical address.
c) Find the physical address of the logical address 12
d) Find the physical address in hexadecimal representation of the logical address $\mathbf{(35)_x}$

11. Consider the following segment table:

| Segment | Base | Length |
|---|---|---|
| **0** | **219** | **600** |
| **1** | **2300** | **100** |
| **2** | **90** | **110** |
| **3** | **1327** | **400** |
| **4** | **1950** | **50** |

What are the physical addresses for the following logical addresses?

a. **0,430** b. **1,10** c. **2,100** d. **2,500**