Some Sample Questions from the textbook

9.1 Name two differences between logical and physical addresses.

9.4 Consider a logical address space of 64 pages of 1,024 words each, mapped onto a physical memory of 32 frames.

a. How many bits are there in the logical address?

b. How many bits are there in the physical address?

9.5 What is the effect of allowing two entries in a page table to point to the

same page frame in memory?

9.7 Assuming a 1-KB page size, what are the page numbers and offsets for

the following address references (provided as decimal numbers):

a. 3085

b. 42095

c. 215201

d. 650000

e. 2000001

9.8 The BTV operating system has a 21-bit virtual address, yet on certain embedded devices, it has only a 16-bit physical address. It also has a 2-KB page size. How many entries are there in page table?

9.9 Consider a logical address space of 256 pages with a 4-KB page size, mapped onto a physical memory of 64 frames.

a. How many bits are required in the logical address?

b. How many bits are required in the physical address?

9.10 Consider a computer system with a 32-bit logical address and 4-KB page size. The system supports up to 512 MB of physical memory. How many entries are there in page table?

10.15 Assume that a program has just referenced an address in virtual memory. Describe a scenario in which each of the following can occur. (If no

such scenario can occur, explain why.)

- TLB miss with no page fault
- TLB miss with page fault
- TLB hit with no page fault
- TLB hit with page fault

10.18 The following is a page table for a system with 12-bit virtual and physical addresses and 256-byte pages. Free page frames are to be allocated in the order 0x9, 0xF, 0xD.

A dash for a page frame indicates that the page is not in memory.

Page	Page Frame
0	0 x 4
1	0 x B
2	0 x A
3	–
4	–
5	0 x 2
6	–
7	0 x 0
8	0 x C
9	0 x 1

Convert the following virtual addresses to their equivalent physical addresses in hexadecimal. All numbers are given in hexadecimal. In the case of a page fault, you must use one of the free frames to update the page table and resolve the logical address to its corresponding physical address.

- 0x2A1

• 0x4E6

• 0x94A

• 0x316

10.22 Consider the page table for a system with 16-bit virtual and physical addresses and 4,096-byte pages.

Page	Page Frame	Reference Bit
0	9	0
1	–	0
2	10	0
3	15	0
4	6	0
5	13	0
6	8	0
7	12	0
8	7	0
9	–	0
10	5	0
11	4	0
12	1	0
13	0	0
14	–	0
15	2	0

The reference bit for a page is set to 1 when the page has been referenced. Periodically, a thread zeroes out all values of the reference bit. A dash for a page frame indicates that the page is not in memory. The page-replacement algorithm is localized LRU, and all numbers are provided in decimal.

a. Convert the following virtual addresses (in hexadecimal) to the

equivalent physical addresses. You may provide answers in either hexadecimal or decimal. Also set the reference bit for the appropriate entry in the page table.

• 0x621C

• 0xF0A3

• 0xBC1A

• 0x5BAA

• 0x0BA1

b. From what set of page frames will the LRU page-replacement algorithm choose in resolving a page fault?

10.24 Apply the (1) FIFO, (2) LRU, and (3) optimal (OPT) replacement algorithms for the following page-reference strings:

• 2, 6, 9, 2, 4, 2, 1, 7, 3, 0, 5, 2, 1, 2, 9, 5, 7, 3, 8, 5

• 0, 6, 3, 0, 2, 6, 3, 5, 2, 4, 1, 3, 0, 6, 1, 4, 2, 3, 5, 7

• 3, 1, 4, 2, 5, 4, 1, 3, 5, 2, 0, 1, 1, 0, 2, 3, 4, 5, 0, 1

• 4, 2, 1, 7, 9, 8, 3, 5, 2, 6, 8, 1, 0, 7, 2, 4, 1, 3, 5, 8

• 0, 1, 2, 3, 4, 4, 3, 2, 1, 0, 0, 1, 2, 3, 4, 4, 3, 2, 1, 0

Indicate the number of page faults for each algorithm assuming demand paging with three frames.