Assignment for Laboratory 13
Virtual Memory
Computer Science 240

The first three problems are practice problems from the textbook; please try to do them without looking at the solution first.

1. Complete the following table, filling in the missing entries and replacing each question mark with the appropriate integer. Use the following units:
K = 2^{10} (Kilo), G = 2^{30} (Giga, T= 2^{40} (Tera), P = 2^{50} (Peta) or E = 2^{60} (Exa)

No. virtual address bits (n)	No. virtual addresse (N)	Largest possible virtual address
8	_____	_____
_____	$2^{?}$ = 64K	_____
_____	_____	2^{32} - 1 = ?G – 1
_____	$2^{?}$ = 256T	_____
64	_____	_____

2. Determine the number of page table entries (PTEs) that are needed for the following combinations of virtual address size (n) and page size (P):

n	P = 2^{p}	No. PTEs
16	4K	_____
16	8K	_____
32	4K	_____
32	8K	_____

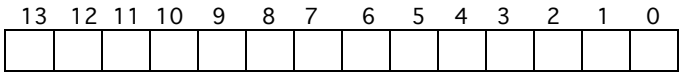
3. Given a 32-bit virtual address space and a 24-bit physical address, determine the number of bits in the VPN, VPO, PPN, and PPO for the following page sizes P:

P	No. VPN bits	No. VPO bits	No. PPN bits	No. PPO bits
1 KB	_____	_____	_____	_____
2 KB	_____	_____	_____	_____
4 KB	_____	_____	_____	_____
8 KB	_____	_____	_____	_____

4. Homework problem 9.11
For the virtual address given below, show how the example memory system in Section 9.6.4 of the textbook translates a virtual address into a physical address and accesses the cache.

Virtual address: 0x027c

A. Virtual address format

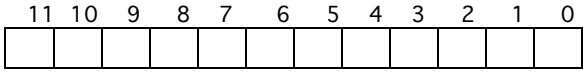


B. Address translation

Parameter	**Value**
VPN	_____
TLB index	_____
TLB tag	_____
TBL hit? (Y/N)	_____
Page fault? (Y/N)	_____
PPN	_____ (enter '-' if a page fault)

If a page fault occurs, skip C and D below

C. Physical address format



D. Physical memory reference

Parameter	**Value**
Byte offset	_____
Cache index	_____
Cache tag	_____
Cache hit? (Y/N)	_____
Cache byte returned	_____ (enter '-' if a cache miss)