CSSE 332 – Operating Systems
Rose-Hulman Institute of Technology
Computer Science and Software Engineering Department

Page Table Structure B

Name:_____   Box:_____

(3 points) Consider a two level paging system. Assume that frames are 256 bytes.

Root Page Table Ptr

0

Main Memory

Physical Address

Frame #	Offset

Addresss	Valid bit	Frame Number
0	1	104
4	1	334
8	0	45
12	1	1
16	1	115
20	1	713
24	1	2
28	0	228
...		
256	1	900
260	1	1005
264	0	820
268	1	20
272	0	5
276	0	1005
280	0	220
...		
512	1	303
516	1	689
520	0	446
524	1	848
528	0	666
532	1	111
536	1	229

Virtual Address

Page #	Offset

or

$Index_1$	$Index_2$	Offset

Register

Interrupt Indicator

1. 2|2|105

2. 6|2|240

3. 3|3|120

(7 points) Consider a 32-bit addressing scheme with 6 bits for Index_1, 12 for Index_2, 14 for the offset and 4 GB of physical memory.

4. How many entries are there in the root page table?

5. How many entries are there in the second level page table?

6. How many total entries are there in the page table structure?

7. What is the minimum size of each page table entry?

8. What is the size of each page?

9. What are the advantages of using a two level page table?

10. What are the disadvantages of using a two level page table?

(5 points) Consider an inverted page table system with hashing. Assume that frames are 1024 Bytes.

Virtual Address

Page #	Offset

Hash Function

Page Table Ptr

256

Main Memory

Addresss	Page #	Frame #	Valid bit	Rel. Ptr
0	104	8	1	0
		...		
256	33	0	0	0
260	81	1	1	0
264	807	2	1	0
268	19	3	1	0
272	41	4	1	-3
276	26	5	0	0
280	803	6	1	-3
284	404	7	0	0

Physical Address

Frame #	Offset

Register

Interrupt Indicator

For each of the following virtual addresses, determine whether or not a page fault occurs, and if a page fault does not occur, translate the virtual address to a physical address.

Assume the hash function is $h(x) = 3 + (x \% 8)$

Note that this system uses chained hashing, with the Rel Ptr indicating the page table elements to the next entry in the chain.

11. 81|105

12. 41|640

13. 25|320

14. 28|204

15. 19|880