New York University

CSCI-UA 201, Section 3

Computer Systems Organization, Spring 2015

Lab Assignment 3: The Virtual Memory Lab

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Problem 2

Part 1

(a) The box below shows the format of a virtual address. Indicate (by labeling the diagram) the fields (if they exist) that would be used to determine the following: (If a field doesn't exist, don't draw it on the diagram.)

- VPO: $[9-0]$
- VPN: $[15-10]$
- $TLBI$: $[11-10]$
- $TLBT$: $[15-12]$

(b) The box below shows the format of a physical address. Indicate (by labeling the diagram) the fields that would be used to determine the following:

- PPO: $[9-0]$
- PPN: $[13-10]$

Part 2

Virtual address: 2F09

A. 0010 1111 0000 1001

B.

Parameter	Value
VPN	0x0B
TLB Index	0x3
TLB Tag	0x2
TLB Hit? (Y/N)	N
Page Fault (Y/N)	N
PPN	0x1

C. 00 0111 0000 1001

Virtual address: 0C53

A. 0000 1100 0101 0011

B.

Parameter	Value
VPN	0x03
TLB Index	0x3
TLB Tag	0x0
TLB Hit? (Y/N)	Y
Page Fault (Y/N)	N
PPN	0xD

C. 11 0100 0101 0011

Problem 3

Given the contents of the heap shown on the left, show the new contents of the heap (in the right table) after a call to `free(0x400b010)` is executed. Your answers should be given as hex values. Note that the address grows from the bottom up. Assume that the allocator uses immediate coalescing, that is, adjacent free blocks are merged immediately each time a block is freed.

Address	
0x400b028	0x00000012
0x400b024	0x400b611c
0x400b020	0x400b512c
0x400b01c	0x00000012
0x400b018	0x00000013
0x400b014	0x400b511c
0x400b010	0x400b601c
0x400b00c	0x00000013
0x400b008	0x00000013
0x400b004	0x400b601c
0x400b000	0x400b511c
0x400affc	0x00000013

Address	
0x400b028	0x00000022
0x400b024	0x400b611c
0x400b020	0x400b512c
0x400b01c	0x00000012
0x400b018	0x00000013
0x400b014	0x400b511c
0x400b010	0x400b601c
0x400b00c	0x00000022
0x400b008	0x00000013
0x400b004	0x400b601c
0x400b000	0x400b511c
0x400affc	0x00000013