

COL331/COL633 Minor2 Exam
Operating Systems
Sem II, 2016-17

Answer all 8 questions

Max. Marks: 25

1. True/False. Copy-on-write allows faster implementation of UNIX's fork() system call. Briefly explain. (No marks if incorrect explanation). [2]

2. True/False. Different virtual addresses in the same page table (belonging to a single process) could point to the same physical memory address. In other words, is it possible for two different virtual addresses VA1 and VA2 (both in the same page table PT) to point to the same physical address PA. Briefly explain when this could happen, with example from real operating systems. (No marks if incorrect example/explanation). [3]

3. True/False. Different virtual addresses in different page tables (belong to two different processes) could point to the the same physical memory address. In other words, is it possible for two different virtual addresses VA1 and VA2, belonging to different page tables, PT1 and PT2 respectively, to point to the same physical address PA. Notice that the virtual addresses VA1 and VA2 must be different. Briefly explain when this could happen, with example from real operating systems. (No marks if incorrect example/explanation). [3]

4. Mention two advantages of paging over segmentation, and two advantages of segmentation over paging (briefly). [2]

5. What are some important differences between the L1 cache and the Translation Lookaside Buffer (TLB)? Focus on the most important differences, starting with their purpose, their organization, and their characteristics. [3]

6. xv6 : What is the significance of lines 2521-2522 in the userinit function? The lines are reproduced below. [3]

```
2521 p->tf->esp = PGSIZE
```

```
2522 p->tf->eip = 0
```

7. xv6 : Explain the function `argint(int n, int *ip)` on line 3545.

- What is 'n' [0.5]
- What is 'ip' [0.5]
- Why is it calling `fetchint(proc->tf->esp + 4 + 4*n, ip)` [2]
- What does `fetchint()` on line 3516 do? Explain the two checks on line 3519. Why are they needed? Do we need two checks, or would one check suffice? [2]

8. xv6: Look at line 3073 in the kfree() function:

```
3072 //Fill with junk to catch dangling refs  
3073 memset(v, 1, PGSIZE)
```

The comment says that this call to memset() is supposed to fill the memory region with junk to catch dangling references. What is a dangling reference? Briefly give an example of how this command will help to catch a dangling reference. Will the xv6 kernel run correctly if this line (line 3073) is commented out? [4]

