

This exam consists of two pages

- 1 Which of the following instructions should be allowed only in kernel mode?
- (a) Disable all interrupts.
 - (b) Read the time-of-day clock.
 - (c) Set the time-of-day clock.
 - (d) Change the memory map.
- 6pt*
- 2 What are the advantages and disadvantages of monolithic OS architectures (e.g., Linux) compared to micro-kernel-based multiserver OS architectures (e.g., MINIX)?
- 6pt*
- 3 You are requested to implement a system call firewall, which monitors system calls and selectively applies rules to them. Where and how would you implement it and why?
- 6pt*
- 4 What are the three main states that a process can be in? Describe the meaning of each one briefly.
- 6pt*
- 5 Give an example of priority inversion and describe one solution to this problem.
- 6pt*
- 6 What is the difference between a mutex and a spin lock? When would you use one or the other?
- 6pt*
- 7 Disk requests come in to the driver for cylinders 10, 22, 20, 2, 40, 6, and 38, in that order. A seek takes 10 msec per cylinder moved. How much seek time is needed for:
- (a) First-come, first served.
 - (b) Closest cylinder next. (Shortest Seek Time First)
 - (c) Elevator algorithm (initially moving upward).
- In all cases, the arm is initially at cylinder 20.
- 6pt*
- 8 Explain the difference between memory-mapped I/O and I/O ports.
- 6pt*
- 9 Describe the steps a device driver needs to perform to read a block of data from the disk.
- 6pt*
- 10 The Intel 8086 processor does not support virtual memory. Nevertheless, some companies previously sold systems that contained an unmodified 8086 CPU and do paging. Make an educated guess as to how they did it. (*Hint*: think about the logical location of the MMU.)
- 6pt*

11 What is copy-on-write (COW) and how does it work? Also, give one use case for copy-on-write. *6pt*

12 What is the purpose of the following code? What does each instruction do?

```
1  push  ecx
2  push  edx
3  push  eax
4  call  _main
5  push  eax
6  call  _exit
7  hlt
```

6pt

13 It has been suggested that the first part of each UNIX file be kept in the same disk block as its i-node.
What good would this do?

6pt

14 What are the factors limiting the maximum file size in UNIX-like file systems?

6pt

15 Describe the disk accesses needed in the worst case to read a byte from a file in UNIX-like file systems.

6pt