

Name: \_\_\_\_\_

**Directions:** Work on this sheet (both sides, if needed) only; **do not turn in any supplementary sheets of paper.** There is actually plenty of room for your answers, as long as you organize yourself BEFORE starting writing. In order to get full credit, **WRITE LEGIBLY** ( $\infty$  points off for illegible handwriting!), and **SHOW YOUR WORK.**

1. (10) Fill in the blank: The action in which a disk read/write head moves from one track (cylinder) to another is called a \_\_\_\_\_.
2. (5) Fill in the blank: The standard for the Internet protocols was set by the \_\_\_\_\_ operating system.
3. (10) Fill in the blank with either “UDP” or “TCP”: Of the UDP and TCP protocols, \_\_\_\_\_ is the one which requires more handshaking.
4. (10) Suppose we have a memory-mapped I/O system, and that a certain I/O device has ports 50 and 51, the former for data and the latter for indicating a “character ready” condition (1 means ready, 0 means not ready). Consider the code

```
T: MOV R2, [51]
    JZ T (jump to T if Zero bit is set)
    MOV R2, [50]
    MOV [1000], R2
```

Fill in the blank: The type of I/O being used here is called \_\_\_\_\_.

5. Suppose we have a set of two mirrored disks, named disk 0 and disk 1, containing 100 tracks each. In the beginning, the read/write heads of the two disks are positioned over tracks 12 and 52, respectively. Then there are accesses to the system: A read on track 15; a read on track 40; a write to track 38.

- (a) (10) Fill in the blanks with numbers: After the second access (read on 40), the read/write head of disk 0 will be positioned over track \_\_\_\_\_ and that of disk 1 will be positioned over track \_\_\_\_\_.
- (b) (10) Fill in the blanks with numbers: After the third access (write to 38), the read/write head of disk 0 will be positioned over track \_\_\_\_\_ and that of disk 1 will be positioned over track \_\_\_\_\_.

6. This problem concerns the bus performance analysis on pp.665-666.

- (a) (10) Suppose the phrase “4-word” next to the green-highlighted word “Answer” on p.665 is

changed to “8-word.” What will the number 2880 change to?

- (b) (10) Suppose that in Characteristic 4, p.665, the time for additional accesses is 30 ns instead of 20 ns. What would the figure 812 on p.666 change to?

7. (5) Explain why even a home PC could be called a “multiprocessor system.”

8. (10) Fill in the blank: The name of the TRAP instruction in the MIPS instruction set is \_\_\_\_\_.

9. (10) Assume the same conditions we had in our example in class of computing average seek time, except that now the two accesses are not assumed to be fully independent. In order to model temporal locality, we will assume that half the time  $Y = X$  and the other half of the time  $Y$  is chosen randomly among the tracks 1 to 100 independently of  $X$ . Find the average seek time, expressed as a double sum as in class (do NOT evaluate the sum).

### Solutions:

1. Seek.
2. Unix.
3. TCP.
4. Polling.
- 5.a. 15, 40.
- 5.b. 38, 38.
- 6.a.  $1 + 40 + 2 \times (2+2) = 49$  cycles per block;  $256/8 = 32$  blocks;  $49 \times 32 = 1568$  cycles in all.
- 6.b. Need a “Step 5” on p.666, since the reads after the first take 6 cycles instead of 4. “Step 5” is 2

cycles. Thus we need  $1 + 40 + 4 \times (2+2+2) = 65$  cycles per block. There are still 16 blocks, so we need  $65 \times 16 = 1040$  cycles in all. (The figure 1008 is also acceptable.)

7. A DMA controller acts as a simple CPU, writing to and reading from memory.

8. Syscall.

9. The answer is half the original figure, or about 16.