Solutions to homework2:

7.8

Advantages of memory mapped I/O:

1. No additional control lines are needed on the bus to distinguish memory commands from I/O commands.（独立编址需要CPU提供存储器读/写、I/O设备读/写两组控制信号，而统一编址不需要）

2. Addressing is more flexible. Examples: The various addressing modes of the instruction set can be used, and various registers can be used to exchange data with I/O modules.（统一编制不需要为IO设备设置专门的IO指令，使用统一的访存指令即可访问IO端口，更加灵活）

Disadvantages of memory-mapped I/O:

1. Memory-mapped I/O uses memory-reference instructions, which in most machines are longer than I/O instructions. The length of the program therefore is longer.

2. The hardware addressing logic to the I/O module is more complex, because the device address is longer.

7.9

a. The processor scans the keyboard 10 times per second. In 8 hours, the number of times the keyboard is scanned is 10 × 60 × 60 × 8 = 288,000.

b. Only 60 visits would be required. The reduction is 1 – (60/288000) = 0.999, or 99.9%

7.10

a. The device generates 8000 interrupts per second or a rate of one every 125 μs. If each interrupt consumes 100 μs, then the fraction of processor time consumed is 100/125 = 0.8

（这里将8KB近似为8000B进行计算）

b. In this case, the time interval between interrupts is 16 × 125 = 2000 μs. Each interrupt now requires 100 μs for the first character plus the time for transferring each remaining character, which adds up to 8 × 15 = 120 μs, for a total of 220 μs. The fraction of processor time consumed is 220/2000 = 0.11