**Exercise: I/O**

1. In the \_\_\_\_ method to synchronize the operation of the CPU with the I/O device, the I/O device informs the CPU when it is ready to transfer data.

A. programed I/O

B. interrupt-driven I/O

C. DMA

D. isolated I/O

1. In the \_\_\_\_ method to synchronize the operation of the CPU with the I/O device, the CPU should actively check the status of the I/O device.

A. programed I/O

B. interrupt-driven I/O

C. DMA

D. isolated I/O

1. In the \_\_\_\_ method to synchronize the operation of the CPU with the I/O device, a large block of data can be transferred from an I/O device to memory directly.

A. programed I/O

B. interrupt-driven I/O

C. DMA

D. isolated I/O

1. A computer uses memory-mapped I/O addressing. The address bus width is 10-bit. Each memory block is 1 word, and the total address space for the memory is 1000 words. Suppose each I/O controller uses 4 registers and each register is 32 bits, how many I/O controller can be supported at most?
2. A computer supports three I/O techniques: programmed I/O, interrupt-driven I/O and DMA.
   1. The programmed I/O does not incur any extra overhead to access data in device A, if the device is available. If the device is unavailable, the CPU has to keeping polling the device, until it is available.
   2. The interrupt-driven I/O incurs 0.5ms overhead for each interrupt service.
   3. The DMA incurs 10ms overhead each time it is configured.

Suppose a program needs to access 10MB data in device **A** in total, each time access 1MB. The device is available every 4ms.

If we do not consider the time for the program to access the data in device **A**, its pure execution time is 100ms.

The time to transfer 1KB data between the CPU and the device is 0.001ms. The time to transfer 1KB data between device and the memory is 0.0012ms, and the time to transfer 1KB data between CPU and the memory is 0.0008ms. To access the 10MB data, the DMA only needs to be configured once.

Which technique is the best for this program?