

CMPE401

Computer Interfacing

Quiz #2

December 3, 2007

Name: _____ SOLUTION _____

ID: _____

3 questions. 15 minutes.

Allowed material:

- Course notes
- Calculators
- Textbooks

Model solutions of midterms, finals, quizzes, and assignments are NOT allowed.

Answer the questions in the space provided.

Write clearly otherwise your answer will not be marked.

Marks:

Question 1: _____

Question 2: _____

Question 3: _____

Total: _____

Question 1 (Data transferring)

- a) Determine the polling overhead for a peripheral device that requires 80 clock cycles to perform one polling operation. The device uses an internal clock at 16MHz. Determine the fraction of CPU time required to transfer information from the peripheral device. The peripheral device transfers data to the CPU in 8-bit words at a rate of 32KB/s. No data should be lost.

$$(32 \times 2^{10}) \times 100 = 3,276,800 \text{ cycles per sec.}$$

Fraction of CPU consumed:
 $3,276,800 / 16,000,000 = 20.48\%$

- b) Within the context of Direct Memory Access (DMA), explain in few words the issues that arise when the CPU has access to cache memory and virtual memory.

The data that is accessed by the DMA controller may not be updated with the data stored in cache or virtual memory. Some synchronization mechanisms must be provided to avoid accessing old data.

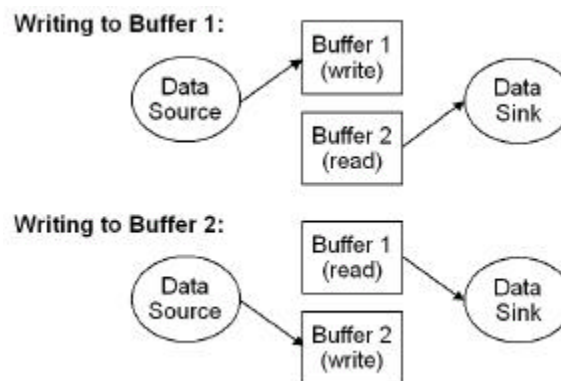
- c) Mention two advantages of interrupt driven data transfer over simple polling.

- Faster data transfer rates can be achieved
- Does not lock the CPU during data transferring

Question 2 (Buffers)

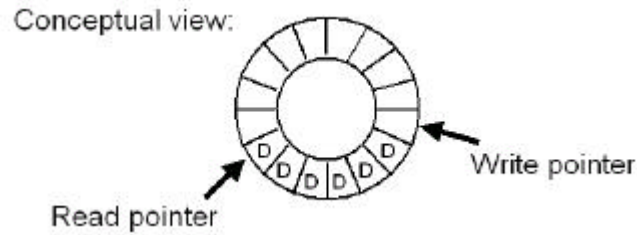
- a) Briefly and concisely explain how double buffers work. Use a diagram as part of your explanation.

Two buffers are used simultaneously, one for writing information and another one for reading previously written data. The effect is that data transfer is accomplished faster than using only a single buffer. Once one of the buffer is filled up with data and the other emptied, the data source writes new information on the previously read buffer while the data reader (data sink) now reads previously written data. The following diagram explains the process.



- b) Briefly and concisely explain how circular buffers work. Use a diagram as part of your explanation.

Circular buffers are can be seen as endless buffers, where one pointer writes information in the buffer while another pointer reads previously written data in the buffer. The writer pointer is called the “back of the queue” and the reader pointer is called the “front of the queue”. The following diagram illustrates the concept.



Question 3 (Flow control)

- a) Within the context of flow control, briefly explain the software flow control mechanism.

Software flow control mechanism is also commonly called the “x-on/x-off” mechanism. The x-on signal is used by the receiver to indicate “resume transmission” to the sender. The x-off signal is used by the receiver to indicate “stop transmission” to the sender.