ECE 375 PRELAB 6

Lab Time: Wednesday 10-12

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QUESTIONS

1. *In computing, there are traditionally two ways for a microprocessor to listen to other devices and communicate: polling and interrupts. Give a concise overview/description of each method, and give a few examples of situations where you would want to choose one method over the other.*

   Answer: In polling, the CPU is constantly being ask whether the CPU needs attention while the interrupt method would notify the CPU if it needed for attention. You need to use polling if you do not know if your CPU will end up interrupt so having it constantly checking it will work in the scenario. While interrupt method will work if you have a scenario where you wanted only report when it actually happens to the CPU so you don't waste CPU cycle.

2. *Describe the function of each bit in the following ATmega128 I/O registers: EICRA, EICRB, and EIMSK. Do not just give a brief summary of these registers; give specific details for each bit of each register, such as its possible values and what function or setting results from each of those values. Also, do not just directly paste your answer from the datasheet, but instead try to describe these details in your own words.*

   Answer:

   EICRA – External Interrupt Control Register A which this will control the interruption are sense in INT0-INT3 (external interrupt). The control also detects on falling edge (10), low-level (00), and rising edge (11).

   EICRB - External Interrupt Control Register B which this will control the interruption are sense in INT4-INT7. This function has the same set of function as EICRA but add in an additional detection of level change (01).

   EIMSK - External Interrupt Mask Register which is a function that allow interruption to be detected or be ignore. The EIMSK can mask out unwanted interrupts. This can be thought of as a safety measure to prevent an undesired event.

3. *The ATmega128 microcontroller uses interrupt vectors to execute particular instructions when an interrupt occurs. What is an interrupt vector? List the interrupt vector (address) for each of the following ATmega128 interrupts: Timer/Counter0 Overflow, External Interrupt 5, and Analog Comparator.*

   Answer: Interrupt vector is an initialization of interruption in the INIT section where placing any code in this address space may cause unwanted behavior. The interrupt vector takes up 70 ($46) locations for initialization. Timer/Counter0 Overflow is at the address $0020, external interrupt 5 is at $000C, and the Analog comparator is at $002E.

4. *Microcontrollers often provide several different ways of configuring interrupt triggering, such as level detection and edge detection. Suppose the signal shown in Figure 1 was connected to a microcontroller pin that was configured as an input and had the ability to trigger an interrupt based on certain signal conditions. List the cycles (or range of cycles) for which an external interrupt would be triggered if that pin's sense control was configured for: (a) rising edge detection, (b) falling edge detection, (c) low level detection, and (d) high level detection. Note: There should be no overlap in your answers, i.e., only one type of interrupt condition can be detected during a given cycle.*

   Answer:

   a) *Rising Edge Detection*: External Interrupt at INT6 and INT18

   b) *Falling Edge*: External Interrupt at INT3 and INT9

   c) *Low Level*: External Interrupt at INT4-INT5 & INT10-17

   d) *High Level*: External Interrupt at INT1-INT2 & INT19-INT21

REFERENCE

Computer Organization and Assembly Language Programming: Embedded Systems Perspective by Ben Lee