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HW#2 ---Microprocessor Fundamentals, I/O Ports
(Ref. Text Ch. 7.1~7.2, and ATmega 128 Manual, Lab#2 Manual)

(1) (M, P1)[1] 8-bit AVR microcontroller has two versions: one is ATmega128, the other is ATmega128L. What is the difference between these two?

(2) (M, P1, P18-35) In ATmega128, how many memory types are available? What are these memories' sizes? What purpose are these memories used for?

(3) (M, P1, P249), What is/are function(s) of JTAG Interface?

(4) (M, P10) ATmega128 uses AVR CPU. This CPU (Central Processing Unit) can perform which following functions?

I. Access memories
II. Perform calculations
III. Control peripherals
IV. Handle interrupts

(A) I and II
(B) II and III
(C) I, II, and III
(D) All

(5) (M, P10-12) The mathematical and logic operations, as well as bit manipulation, are implemented by which following component(s) inside a CPU?

(A) ALU
(B) Data registers
(C) Control unit
(D) Instruction Decode

(6) (Text P241) Communication to and from the microprocessor occurs through which following device(s) connected to the bus?

(A) ALU (Arithmetic Logic Unit)
(B) Data registers
(C) I/O device
(D) Control unit

[1] "M" means the ATmega 128 Manual (you can download the manual from our course Website and click on "Lab Info"). "P" is the page number.

(7) (Text P241; M, P1) The ATmega128 is a low-power CMOS ____ (8, or 16, or 32) bit microcontroller based on the AVR enhanced RISC architecture (Reduced Instruction-Set Computer – means the set of instructions is small). RISC microprocessors are cheaper to design and manufacture and usually faster.

(8) (Text 241) Which following languages (codes) can be executed by a CPU?

(A) Assembly language
(B) Machine language
(C) Binary Codes
(D) All of above languages

(9) (M, P59) One of important functions of a microcontroller is the *Interrupt Handling*. How many types of interrupts in ATmega 128? Briefly state any two interrupts' functions.

(10) (M, P5-7) In ATmega128,
How many I/O ports?

Which port is reserved for the analog inputs to the A/D Converter?

Which port serves the function of the JTAG interface?

(11) (Text P242-3) All microcontrollers have the digital I/O ports. These digital I/O ports can be used to implement which following tasks?

I. Allow binary data to be transferred to and from the microcontroller using external pins on the IC, including to:
-- read the state of switches and on-off sensors
-- interface to external A/D and D/A converters
-- control digital displays, or on-off actuators

II. Transmit signals to and from other microcontrollers to coordinate various functions.

(12) (Text P243 and P239) SPI stands for Serial Peripheral Interface;

I^2C stands for _____;

MPU stands for _____;

UART stands for _____;

USART stands for _____;

(13) ATmega128 is manufactured by which following company?

I. Intel
II. MicroChip
III. Motorola
IV. Atmel

(14) Buses are the sets of internal conductors that connect the pieces of the microcontroller together. There are three types of buses: Address Bus, Data Bus, and Control Bus. The address bus carries the _____ of a location in memory of I/O; the data bus carries _____ to and from memory or I/O ports; the control bus carries _____ to memory and peripherals.

(15) ATmega128 microcontroller can service up to _____ digital inputs or outputs?
(A) 16
(B) 32
(C) 48
(D) 53

(16) (Lab#2 Manual) How many jumpers in ATmega 128? Explain each jumper's function (refer to the ATmega 128 Manual).