

Final exam "Embedded Systems". 6 May 2018
Time 2 hours. Do all questions.

1. Programming with interrupts

A clock with GPS time sync.

Write a program (pseudo code) that implement these functions:

- 1) a clock (assume 4 digits display), this clock must be "settable"
- 2) the arduino box that run the clock is able to connect to a GPS.
- 3) the box can read "time" from GPS.
- 4) at midnight every night, the clock read GPS time and set the time.

You must use "interrupt" to implement some of these functions. You can assume some low level functions, such as, reading GPS time. However, you must write a program to implement "clock".

2. embedded systems design

A Toy factory needs to implement its automation. There are 100 machines that required monitoring and command. Let us assume these machines can talked to an Internet of Thing Box. Let us furthur assume, these IoT boxes are connected to machines one-on-one (one box per one machine). A IoT Box has several ports to receive information from the machine. IoT Box can also issue commands to run the machine.

Design a "system" of these connected IoT Box.

- 1) How these boxes will be connected and communicate.
- 2) How to manage the information to-and-from these boxes.
- 3) Propose a Command Panel that a human operator can use this system. Draw a picture of your design.
 - 3.1) What an operator can do from this Command Panel.
 - 3.2) How this Command Panel (assume it is implemented on a PC) communicate to many IoT boxes.

3. open question: IoT 5G readiness search "Thailand is not ready for 5G"

Discuss the following topics:

- 1) What is 5G and its relation with IoT?
- 2) what is needed for 5G deployment, when?
- 3) What is the spectrum (frequency) for 5G?
- 4) What is Thailand readiness for 5G?

END