

ECE 1175 - Homework 1 Solutions

Question 1

Any reasonable requirement is acceptable. Here only provides the suggested answer to 1).

1) An embedded sensor for home security system

- **High Accuracy**

To ensure low false negative and false positive rate, the sensor should provide reliable and high-resolution readings for the system to decide whether to trigger the alarm or not.

- **Low Latency**

To timely spot any risk, the sensor should be able to collect readings in very short time.

- **Good Durability**

To keep alive as long as possible, the sensor should either consume ultra-low power or have a large battery. Frequent power outage is not acceptable to maintain the home security. In addition, it is also supposed to work well under harsh environmental conditions.

Question 2

- **WiFi chip on a smartphone – ASIC**

Making it fast is the key of WiFi design. To run on smartphones, it should also be low-power to have long battery life. It's not necessary to consider reprogrammability because big companies would like to let people buy its new hardware rather than release software update.

- **Image processing chip on a camera – ASIC**

Basically the same reason as the WiFi chip.

- **Controller chip of a robot arm in assembly line – FPGA**

Here manufacturers should provide some programmability to let the assembly line engineer customize the robot arm operations for various purposes. And power is not a big concern on assembly line.

Question 3

Any reasonable design is acceptable.