ACTIVE LEARNING

Question 1:

Air-conditioners and Pacemakers are embedded systems as they have a specific function, and the all the system design is concealed from the user that interacts with simple interfaces.

Mobile phones used to be an embedded system when they had a simple interface and could only be used for low-level tasks such as calling or texting. However, nowadays much more complexity has been added to the interfaces and smart phones can be used for many applications and the user is able to interact with the system and customize it to suit his needs.

The same reasoning is true for laptops.

Question 2:

Designed to perform a specific task:

A microwave has a timer that is designed to perform a specific task of taking an input from the user with the timer that the user would like to heat up the food for. Over time, they became complex, but the functionality is still the same.

Interacts with the user using a simple interface:

Elevators have panels with several buttons that perform very simple functions. These buttons are used to select the level you’d like to go to and if you’d like to keep the doors open, call emergency, etc…

Has to perform its task efficiently:

If any of the above systems didn’t perform its basic functionalities efficiently, it would create a lot of complexity in our lives.

Constrained in processing, performance, memory, peripherals, size:

A pomodoro timer is a small device that keeps track of time according to what the user sets it up for. The only thing the user can do is basically wind it back to select how long he’d like the timer to countdown.

Constrained due to efficiency requirements: Fitness trackers need to be light so that high performance athletes can wear them during their practice/performance.

Used in life-critical and cost-critical environments: Pacemakers, defibrillators and other medical devices have embedded systems that allow them to perform their functions and consequently save lives. Other embedded systems have a very short lifespan such as blood glucose monitor patches that can only be used once. Therefore, if the components were expensive its use would not be viable.

Question 2.b)

Embedded systems have their hardware, firmware and software designed to be lean and perform very specific tasks relevant to the applications they’re embedded in. Our personal computers are computing machines that can host several applications and be programmed to execute a multitude of tasks depending on what the operator requires.

Question 3)

Raspberry Pi 3 components:

* 64-bit quad-core 1.4GHz processor.
* 1GB RAM Memory
* Ports:
  + Ethernet
  + HDMI
  + Audio
  + RCA
  + USB
* GPIO Pins
* Power Supply
* Wifi, Bluetooth, and Bluetooth Low Energy modules

Question 5)

The embedded systems that could be used to look after a pet would be:

* Actuator that can turn water tap on/off connected to a sensor that measures the level of water on a container to ensure the pet always has access to water.
* Timeclock connected to actuator that can open a container with food for the pet at its meal times.
* GPS tracking system with an alert in case the pet goes outside of a previously set safe area.
* Actuators capable of closing/opening pet doors to allow transit of the pet between the rooms of the house.