1- Every time I travel for more than few days all my plants die. I need a design that water the plants frequently (ex.: every 2 days) a certain amount of water. Write a clear and concise problem statement without any biases or implied solutions for this problem. Make sure your problem statement is specific to the problem but general to how it will be solved. (5 points)

Answer:  Design a system that water my plats at my home sufficiently with a specific frequency (ex.: every two days) when I am travelling and not at home.

Tips:

* Best way is to start with “Design a system that…”
* The features of the problem mentioned in the question should be reflected or mentioned in the problem statement (“traveling”, “frequency”, “a certain (sufficient) amount of water”)

2- To define this problem and the solution for it better, write two objectives, two constraints, and two functions required for the solution. Make sure that these attributes are relevant to *any*possible solution, and do not describe one particular solution (18 points, each 3 points).

Objective 1: Automatic (as it should work without supervision)

Objective 2: programmable (So I program it for certain amount of water and timing before leaving home)

Constraint 1: not costly/expensive

Constraint 2: safe for environment

Function 1: should water plants

Function 2: water plant at correct frequency

Tips:

* Objective should be adjective, function should be verb
* Do not write similar objectives and functions

3- For one of the objectives you wrote for the previous problem and **write two good, relevant metrics**. Also, for one of your functions **write two good, relevant specifications**.(12 points, each 3 points)

The objective I chose: programmable

Metric1: It should be easy for almost every one to program it (even the people who do not know anything from computers and programming)

Metric2: At least 2 features of it: “the time of watering” and “the amount of water” should be defined by programming

The function I chose: should water plants

Specification 1: the number of plants to water: between 5 to 20

Specification 2: should be able to do the task for at least 1 hour per day

Tips:

* Metrics and specifications are measures, so the best way to write them is to provide numbers

4- Suppose that you came up with a design but it is expensive. You need to change some attributes of your design to reach to the highest-possible-quality with less cost (this is known as design tradeoff). Explain the **design tradeoffs** you consider in terms of possible harms, hazards and risk of litigation and complaints and returns.  (7 points)

To design this system I use plastic tubes as it will be lighter and cheaper but I use safe coating inside tubes to remove harm to environment. I use batteries to provide power for this design instead of plugging it to electricity as there is a danger of fire if the system will be connected to electricity all the time I am away (hazards). I use cheap but durable material as if the system works for a very short time there is a risk of complaints and returns from customers.

Tips:

* You need to write a short paragraph and explain what you do (mentioning specific changes) for design tradeoffs considering harms, hazards and risk of litigation and complaints and returns. Few sentences without explaining is not enough.

5- Finally you need to use design for assembly & manufacturing principles for your design. Briefly describe two design for assembly & manufacturing you consider for your design.  (18 points, each 9 points)

First design for assembly & manufacturing principle: minimize the number of assembly operation: I minimize the number of assembly operation as before trips people are busy packing and do not have much time to spend for assembling this system.

Second design for assembly & manufacturing principle: I avoid separate fasteners as this is a system that is not used very frequently, only when people are travelling so having separate specific fasteners for this system and investing for them is not reasonable.

Tips:

* Look at slide 25 of “Midterm review” power point file, choose two methods and explain why and how you use them. Mentioning methods without explaining the reason to apply them is not sufficient.