Satish Food Private limited (SFPL) manufactures packed food. One of the highest selling product is Veg-Hakka Noddle (VKN).

* They have estimated the monthly demand of VKN as D(t) Kgs for the month t, where t = 1, 2, .., 12
* They have limited inhouse production capacity PC(t) kgs for the month t, where t = 1, 2, .., 12
* They can outsource the manufacturing of VKN. There is an option of choosing from 3 outsourced manufacturing partners (OMP), there production capacity and cost is
  + Production Capacity: OC1(t), OC2(t), and OC3(t) Kgs for the month t, where t = 1, 2, .., 12
  + Production Cost: CO1(t), CO2(t), and CO3(t) Rs/Kg for the month t, where t = 1, 2, .., 12
* SFPL cannot engage an OMP for more than 5 periods.
* At max 2 OPMs can be engaged in a month.
* Sum of production from all OMPs should not be more than 30% of the total production in any month.

Question 1:

Build optimization model to find out quantity to be produced inhouse, and in OMPs for each month such that overall cost is minimized

1. Assume that excess VKN manufactured during any period t cannot be carried forward to next period i.e. t+1 or t+2 etc. Example,
   1. During t = 5, demand is 100 Kgs, produced is 105 Kg, excess demand = 105 – 100 = 5 Kgs. This excess 5 Kgs cannot be used to meet demand of t > 5

Question 2:

Find out the same set of output with a new assumption which is as follows

1. Assume that excess VKN manufactured during any period t can be carried forward to next period i.e. t+1, t+2 etc. Example,
   1. During t = 5, demand is 100 Kgs, produced is 105 Kg, excess demand = 105 – 100 = 5 Kgs. This excess 5 Kgs could be used to meet demand of t > 5

PFA an excel file with required data. Submit the following

1. An word file with model formulation and explanation of variables, constraints and objective function
2. Formulation of the optimization model in Python. The code should read the input from the attached excel file and create an output excel file. The output excel file will have the production plan.