03.11.22
Due Day: 15.11.22

VÉL 103 F   Design and Optimization
Assignment 5

Electrical distribution network is between transformer station T, and five areas, A, B, C, D and E.

Design a distribution network or connection between the transformer station T and each building, A, B, C, D and E by electrical cable. Lifespan is 20 years and discount or interest rate 8%.
At the transformer station T, high voltage is transformed to 380 V.
The cable is buried under ground and the distance between buildings are according to the location table(m):

Location table:		x (m)	y(m)
	T:	380	510
	A:	439	165
	B:	660	432
	C:	138	409
	D:	447	750
	E:	233	724

The voltage is 380 V and the current to each place,
A: 24A, B:12A, C:21A, D:17A and E:8A.

The energy losses through the cable are, $P = I^2 R$ where, $R = 1.7 \cdot 10^{-5} L / (\pi D^2/4)$

I : Current (Amper)   R: Resistance (Ohm)
L : Length (m)   D: Cable Diameter (m)

Energy price: 315 Mills.

Capital cost for the cable kr/m for different diameters are:
D (m):	0.010	0.012	0.014	0.016	0.018	0.020	0.024	0.036
$/m	9.60	15.75	15.83	23.39	28.77	31.51	44.93	57.96

a.   Make a model for connections and capital cost.
b.   Make a model for current calculations
c.   Make a model for life cycle cost.
d.   Optimize