Exercise 3.1

In a mine a belt conveyor is required. The next data is known:

Material	*Limestone*
Material density	*1,4 t/m^3*
Grain size	*50-250 mm (not classified)*
Material temperature	*Temperature (-10/30ºC)*
Inclination	*0º*
Distance between centres	*L= 250 m*
Required capacity	*800 t/h*
Belt quality	*Normal*

1. Draw a belt conveyor, specifying its components.

2. Obtain the most adequate belt conveyor parameters to carry out its installation:
   a. Belt width.
   b. Weight and distance between carrying and return idlers.
   c. Belt weight per metre.
   d. Mobile components weight per metre.

3. Compute the minimum engine power (unloaded and loaded) taking into account that the transmission ratio is 85%.

4. To improve operation conditions, the selected engine has a maximum power 5% more than the required. Calculate the maximum material that can be transported per hour.

5. If terrain where the belt conveyor will be placed has an inclination of –2º with respect to the horizontal, ¿what minimum engine power would be needed? ¿Could the previous selected engine be used? If the answer is no, calculate the maximum ground inclination (in %) at which the material could be transported.

6. Due to belt inclination, material slides over it, increasing capacity up to 600 m^3/h. Adjust belt speed so that capacity is the required one.

Material	Standard belt width (mm)										
	400	500	650	800	1000	1200	1400	1600	1800	2000	2200
Classification, maximum grain size (mm).	50	75	125	175	250	350	400	450	550	600	600
Not classified, maximum grain size(mm)	100	150	200	300	400	500	600	650	700	750	750

Table 1: Standard belt width (mm)

Grain size(mm)	Belt width (mm)										
	400	500	650	800	1000	1200	1400	1600	1800	2000	2200
<30	2.5	3.15	3.15	3.55	4.0	4.0	4.0	4.0	4.5	4.5	4.5
30-300	1.6	2.0	2.5	2.5	3.15	3.15	3.15	3.55	3.55	3.55	.3.55
>300	1.25	1.6	1.8	1.8	2.24	2.24	2.24	2.5	2.5	2.5	2.5

Table 2: Belt speed (m/s)

Idlers distance (m)		Belt width (mm)										
l_1	$l_2 \leq L/100$	400	500	650	800	1000	1200	1400	1600	1800	2000	2200
1.0	2.0	11	13	17	28	37	52	69	82	108	128	145
1.25	2.5	10	12	15	25	33	48	62	75	96	115	131
1.5	3.0	10	11	14	23	31	45	58	70	89	107	121

Table 3: Mobile components weight per metre (kg/m)

Belt width (mm)	400	500	650	800	1000	1200	1400	1600	1800	2000	2200
Diameter Φ (mm)	51	51	63	89	89	89	108	108	133	133	133
Weight $W_1 = W_2$(kg)	3	3.5	5.5	11	13	15	22	25	39	43	47

Table 4: Diameter and carrying and return idlers weight

L (m)	<30	<80	<100	>100
L_0 (m)	50	70	80	100

Table 5:Loss coefficient (L_0)

High quality (low internal friction)	0.017
Normal quality	0.020
Unfavourable operation conditions-overload	0.023-0.030

Table 6: Friction coefficient of mobile components (C)