Problems on plate load test

Important Notes :

- If soil is clay then

  i) (q_f) foundation = (q_f) plate.

  ii) $\frac{S_F}{B_F} = \frac{S_P}{B_P}$

- If soil is sandy then

  i) $\frac{(q_f)\ \text{Plate}}{\text{width of plate}} = \frac{(q_f)\ \text{foundation}}{\text{width of footing}}$

  i.e. $\frac{(q_f)\ \text{Plate}}{B_p} = \frac{(q_f)\ \text{foundation}}{B_f}$

  ii) $\frac{S_F}{S_P} = \left\{\frac{B_F(B_p + 0.3)}{B_P(B_F + 0.3)}\right\}^2$

where,

q_f - Ultimate bearing capacity

S_F and S_p - settlement in foundation and plate respectively.

B_p and B_F - width of plate and footing respectively.

Problem 1) following data corresponds to the load and settlement carried out with plate of size 30 cm x 30 cm on sandy soil.

Load KN/m2	Settlement (mm)
40	2
80	5
120	9
160	14
200	20
240	30

Determine :

a) Ultimate bearing capacity of plate
b) Ultimate bearing capacity of footing 1.2 x 1.2 mt
c) Safe bearing capacity of footing with FOS = 3
d) Settlement of foundation at the SBC as calculated above.

Answer :

a) Ultimate bearing capacity (q_f) Plate = 170 KN/m2 …… see graph

b) Since the soil is sandy ;

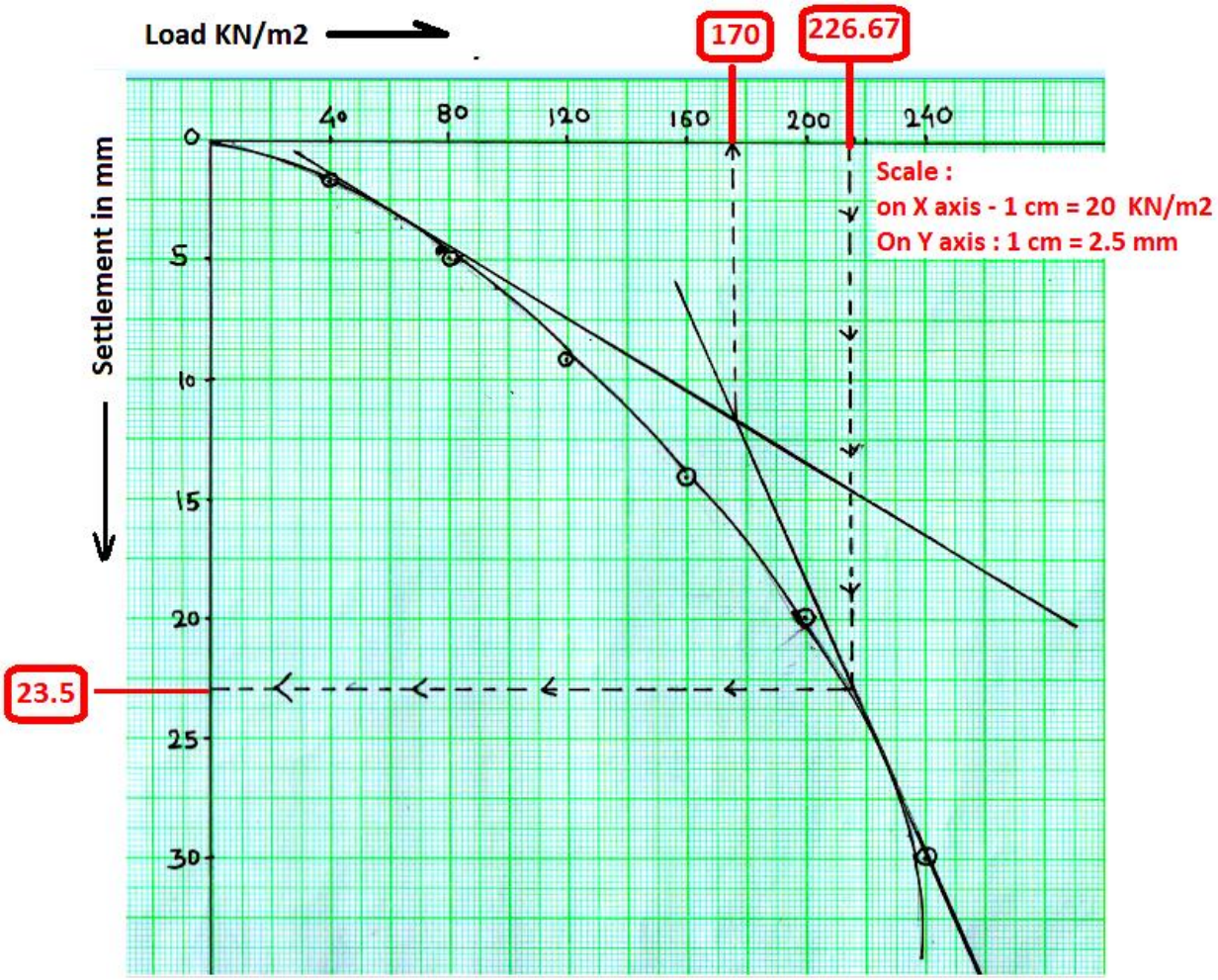
$$\frac{(q_f)\ \text{Plate}}{B_p} = \frac{(q_f)\ \text{foundation}}{B_f}$$

$$\frac{170}{0.3} = \frac{(q_f)\ \text{footing}}{1.2}$$

$$(q_f)\ \text{footing} = 680\ \text{KN/m2}$$

c) SBC $q_{safe} = \frac{(q_f)}{FOS} = \frac{680}{3}$ = 226.67 KN/m2

d) Settlement in plate S_{plate} = 23.5 mm = 0.023 mt.



Problem 2) A plate load test was conducted and the test data is given below. Find ultimate bearing capacity of soil.

Load q KN/m2	Dial guage reading		
	A	B	C
0	0	0	0
55	186	192	192
110	362	365	353
165	766	758	756
220	1886	1889	1865
280	4810	4806	4784
335	14006	14010	13984

The least count of dial guage is 0.01 mm . size of the plate is 300 mm square .

Answer :

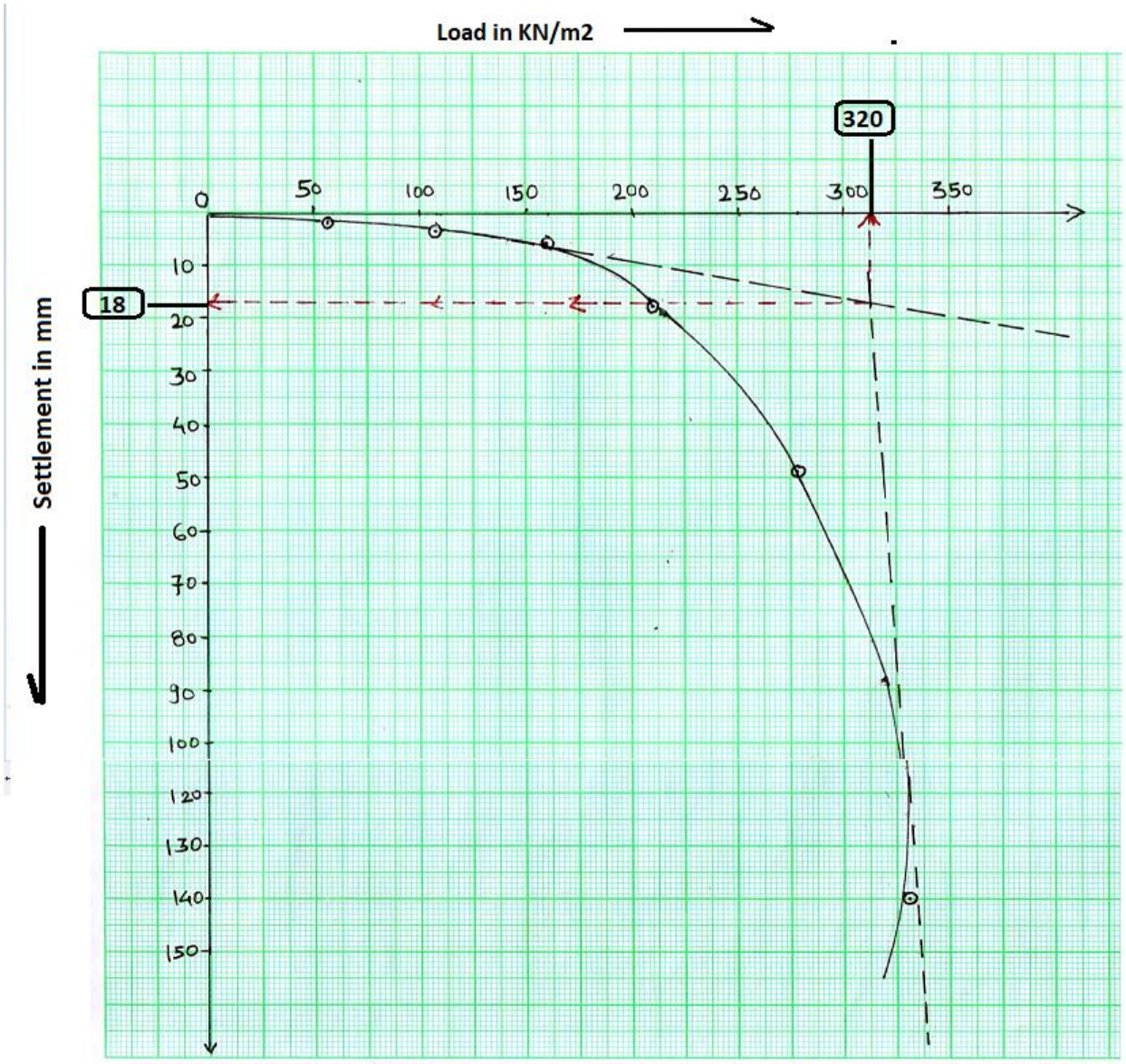
In this problem , it is not mention the type of soil. So, we are assuming the soil as clay (Cohesive)

As per note, we have (q_f) soil = (q_f) foundation = (q_f) plate

(q_f) plate = 320 KN/m2 ……see graph

With settlement S = 18 mm

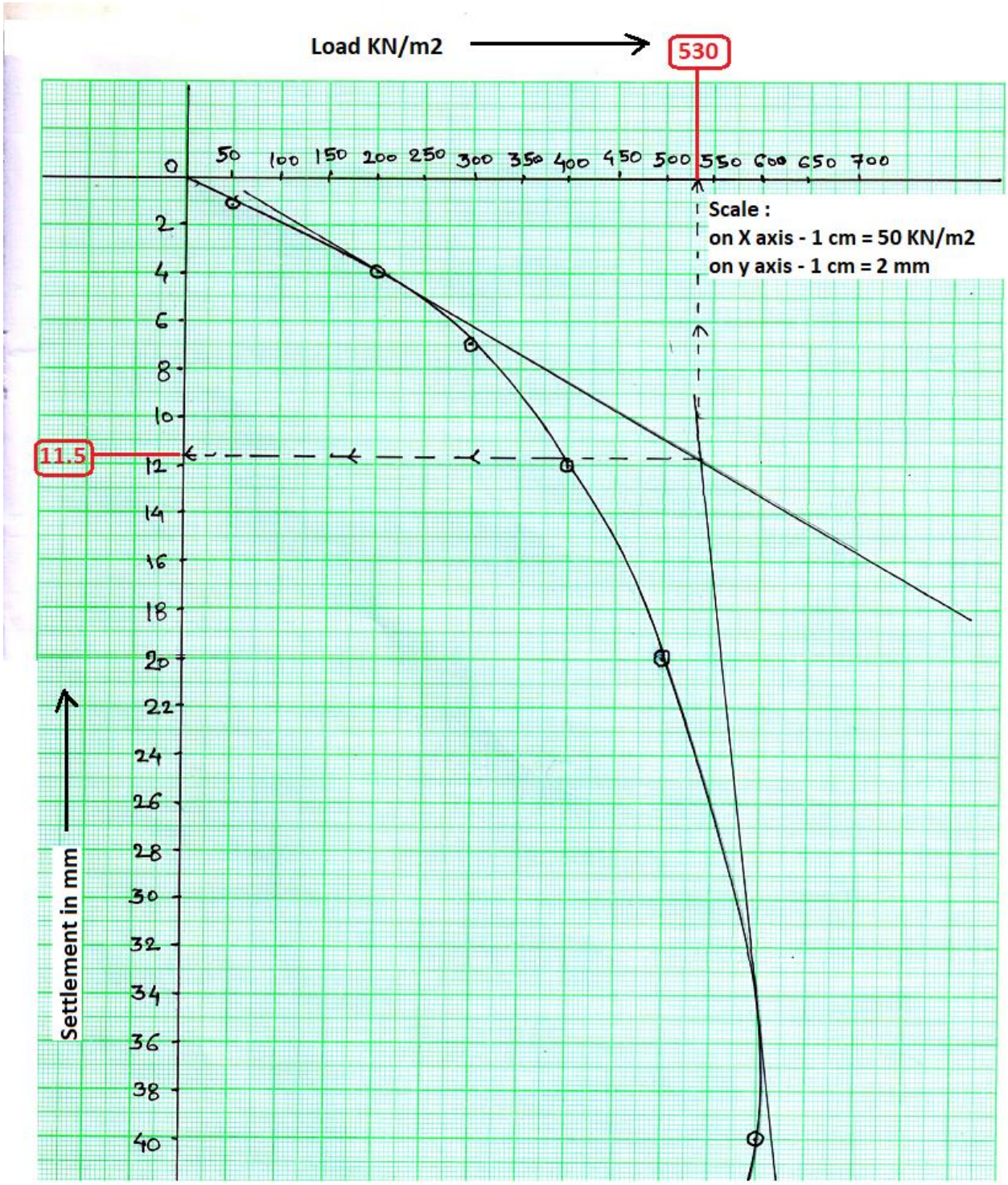
Load q KN/m2	**Dial guage reading**			**Avg. value of dial guage reading**	**Final settlement in mm**
	A	**B**	**C**		
0	0	0	0	0	0 x 0.01 = 0
55	186	192	192	190	190 x 0.01 = 1.9
110	362	365	353	360	360 x 0.01 = 3.6
165	766	758	756	760	760 x 0.01 = 7.6
220	1886	1889	1865	1880	1880 x 0.01 = 18.8
280	4810	4806	4784	4800	4800 x 0.01 = 48
335	14006	14010	13984	14000	14000 x 0.01 = 140



Problem 3) A plate load test is carried out and following results were obtained.

Load KN/m2	Settlement (mm)
50	1.5
100	2
200	4
300	7.5
400	12.5
500	20
600	40

Find ultimate bearing capacity of the soil ?



In this problem , it is not mention the type of soil. So, we are assuming the soil as clay (Cohesive)

As per note, we have (q_f) soil = (q_f) foundation = (q_f) plate

(q_f) plate = 530 KN/m2 ……see graph

With settlement S = 11.5 mm