Solution Summary

Assignment # 7

Q-1

d_n= 290 mm

C_b=185.6

P_{ro}=3282.85 KN

Calculate at least for 5 points

Calculate C

Point	2	3	4 (C_b)	5	6
C	290	200	186	100	75

Strain in Steel Layers

Point	2	3	4	5	6
C_m	290	200	186	100	75
ε_{s1}	0.0027 Yield	0.0025 Yield	0.0024 Yield	0.0014	0.007
ε_{s2}	0.0014	0.0004	0.0002	-0.0026 Yield	-0.0047 Yield
ε_{s3}	0	-0.0016	-0.002 Yield	-0.0067 Yield	-0.01 Yield

Stress in Steel Layers

Point	2	3	4	5	6
C_m	290	200	186	100	75
ε_{s1}	400	400	400	280	140
ε_{s2}	280	80	40	-400	-400
ε_{s3}	0	-320	-400	-400	-400

Force Resultans

Point	2	3	4	5	6
C_m	290	200	186	100	75
N_c	1812.5	1250	1162.5	625	468.75
N_{s1}	306	306	306	214.2	107.1
N_{s2}	214.2	40.8	20.4	-306	-306
N_{s3}	0	-244.8	-306	-306	-306

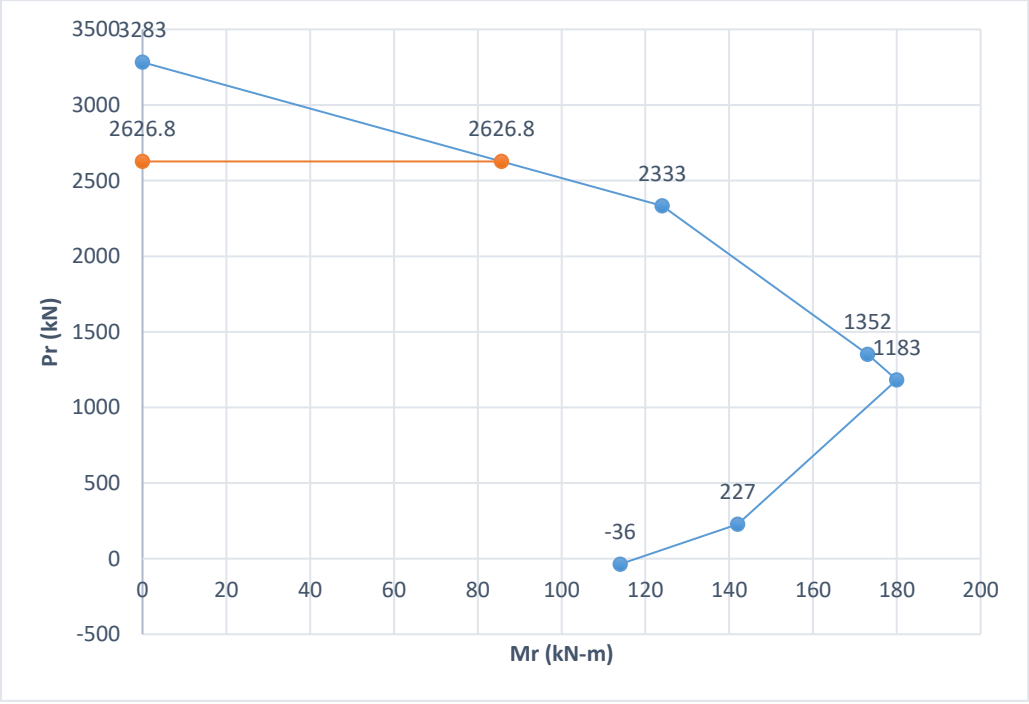
P_r

Point	2	3	4	5	6
$C_{(mm)}$	290	200	186	100	75
P_r	2332.7	1352	1182.9	227.2	-36.15

M_r

Point	2	3	4	5	6
$C_{(mm)}$	290	200	186	100	75
P_r	123.73	173.34	179.76	142	114.24

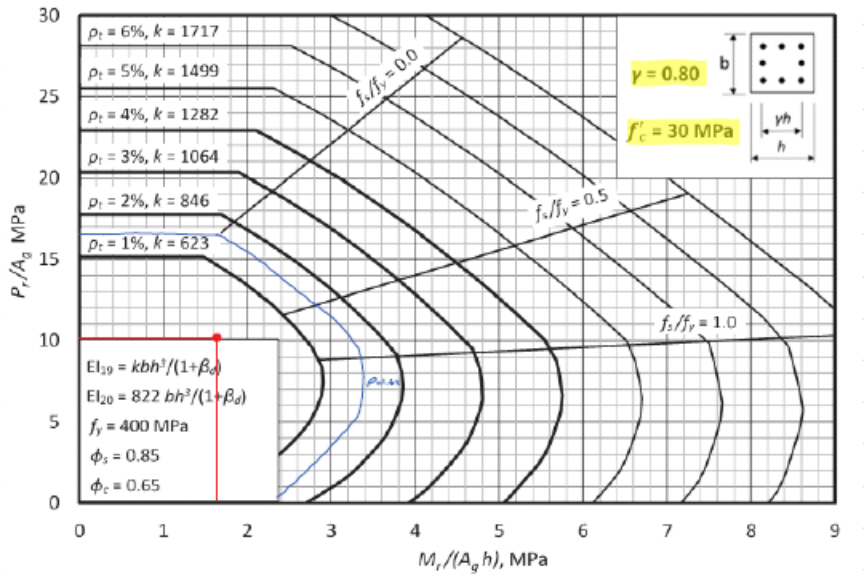
Point	1	2	3	4	5	6
M_r (kN-m)	0	124	173	180	142	114
P_r (kN)	3283	2333	1352	1183	227	-36



Q-2

K	0.9	$\frac{kl_u}{r} \le \frac{25 - 10\left(\frac{M_1}{M_2}\right)}{\sqrt{\frac{P_f}{f_c' A_g}}}$	18 ≤ 33.77 short Column
L_u	3000 mm		
r	0.3X500		

Table 7.10.7 Rectangular Columns with Equal Numbers of Bars on all Faces



Υ_h = 395 mm

$\frac{P_f}{A_g}$= 10

ρ_t= 1.6 %

Υ = 0.8

$\frac{M_f}{A_{gh}}$= 1.6

Verifying CSA Requirements;

- Min and Max amount of Reinforcement

1% ≤ ρ_t= 1.6 % ≤ 4% ➔ O.K

- Min Number of Bars

8 Bars > 4 Bars ➔ O.K

- Min Bar Spacing

	$1.4d_b$	35 mm		S=172.5 ≥ 35 ➔ O.K
Max		30 mm	S_{min} = 35	
	$1.4\ a_{max}$	28		

- Min Tie Diameter

  0.3 d_b = 7.5 mm ➔ d 10M ≥ 7.5 mm

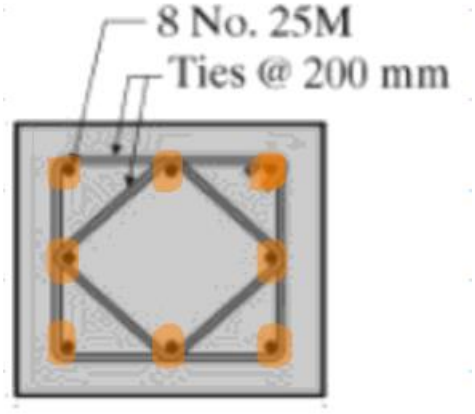
- Min Tie Spacing

	16 d_b	400 mm		S=200 ≤ 400 ➔ O.K
Min	48 d_t	480 mm	S_{tie} = 400	
	b	500 mm		

- Tie Arrangement

S_1=72.5 mm ≤ 150 mm ➔ O.K

S_2=350 mm ≤ 500 mm ➔ O.K



- Cover = 30 mm
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