King Saud University
College of Engineering
Civil Engineering Department

CE 472 Reinforced Concrete II
2nd Semester 1429-1430 H

2nd Mid-Term Exam

إسم الطالب : **الرقم الجامعي:**

Problem 1 (50%)

Figure 1 shows the axial load-moment interaction diagram for the shown tied square column section.

1) From the curve shown, determine the total steel area and the bar diameter used as well as the section dimensions.

2) Check the section safety as a short column when subjected to an axial force *Pu* = 1800 kN and bi-axial moments *Mux* = 180 kN.m and *Muy* = 180 kN.m. (using Bresler reciprocal equation). Assume $\phi = 0.65$

3) Assuming a braced column with 350 x 350 mm section and 4.7 m unsupported length, check the column slenderness when subjected to top and bottom uniaxial moments in clockwise direction, M_{top} = 180 kN.m, M_{bot} = 80 kN.m, and an axial force *Pu* = 1800 kN. Use k = 1.0 and $\beta_d = 0.6$.

Determine the magnified moment and check column safety.

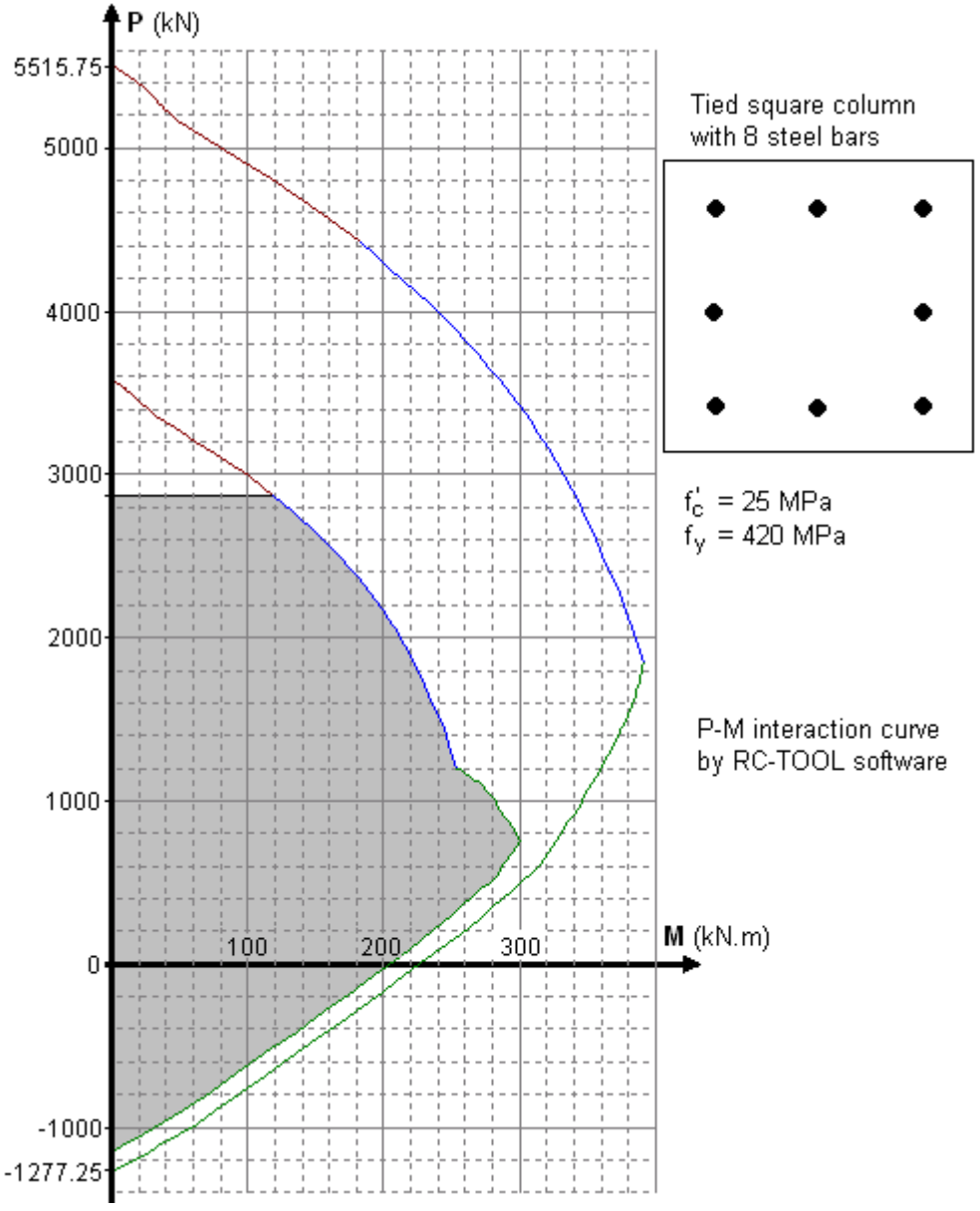

Figure 1: P-M interaction curve for the shown square column

Problem 2 (50%)

Figure 2 shows a flat plate floor with 3 x 3 panels, and a 200 mm slab thickness.

All columns section are 300 x 300 mm, f_y = 420 MPa , f_c' = 25 MPa.

Super imposed dead load = 2.5 kN/m^2, Live load = 2.5 kN/m^2, Concrete unit weight = 24 kN/m^3

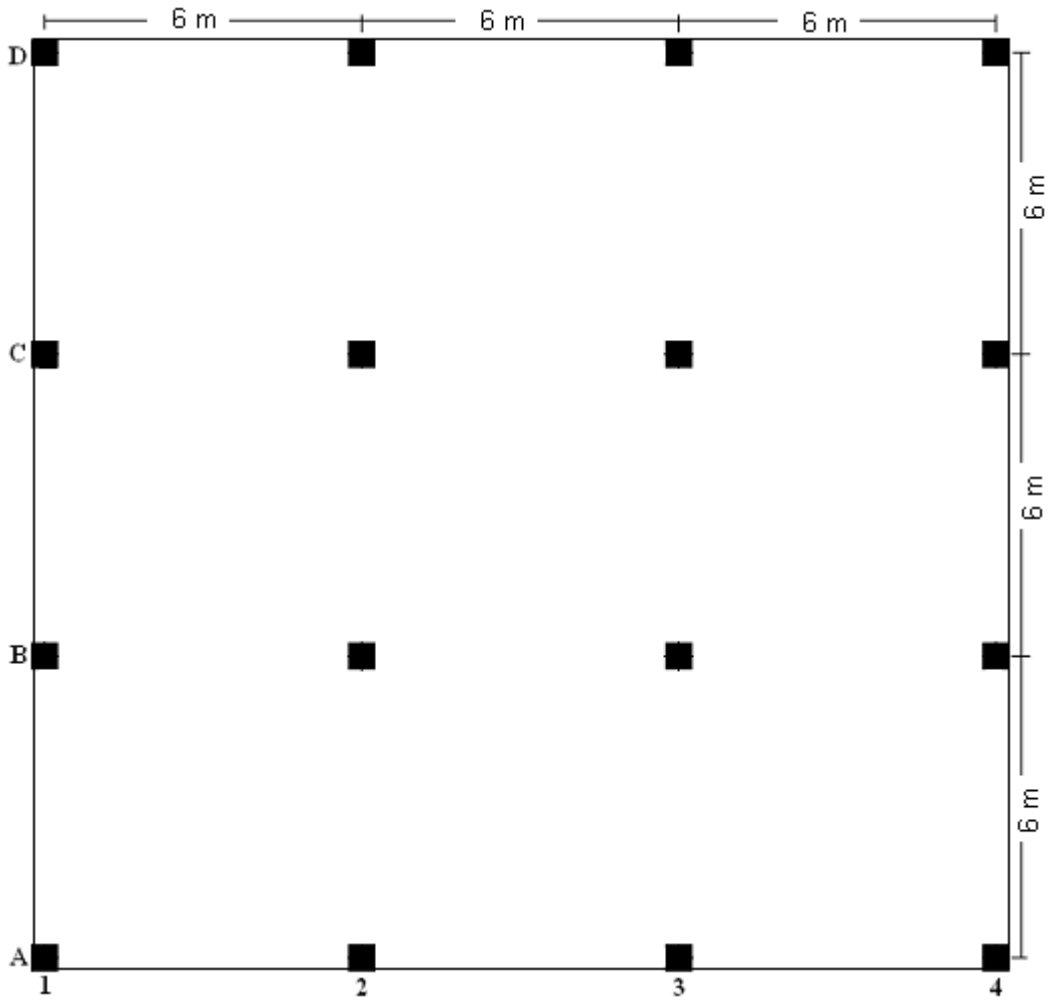

Figure 2: Floor with 3 x 3 similar panels

Flat plate

1) Determine the slab minimum thickness for deflection requirement.

2) Determine the shear panel dimensions and check the two-way shear for edge column D2, assuming an average steel depth of 168 mm.

3) Determine the static moment in the edge panel spanning between columns B1 and B2, as well as the negative and positive moments in the column strip.

4) Design the column strip for a moment of 180 kN.m using 12-mm bars and a steel depth of 174 mm.

Slab with beams

Typical beams are added to connect between all interior and exterior columns of the floor and the slab thickness is reduced to 145 mm.

5) Check the slab thickness for the interior panel B2-B3-C3-C2 assuming that $\alpha_m = 1.9$