King Saud University **CE 472 Reinforced Concrete II**
College of Engineering **1st Semester 1429-1430 H**
Civil Engineering Department

2nd Mid-Term Exam

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Problem 1 (40%)

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

1) Check the section safety as a short column when subjected to an axial force *Pu* = 1200 kN and bi-axial moments *Mux* = 100 kN.m and *Muy* = 200 kN.m. (using Bresler reciprocal equation). Assume $\phi = 0.65$

2) Check the braced column slenderness when subjected to top and bottom uniaxial moments causing single curvature, M_1 = 140 kN.m, M_2 = 180 kN.m, and an axial force *Pu* = 1200 kN, assuming *k* = 0.9 and $\beta_d = 0.75$.

Determine the magnified moment and check column safety. The unsupported column length is 5.5 m

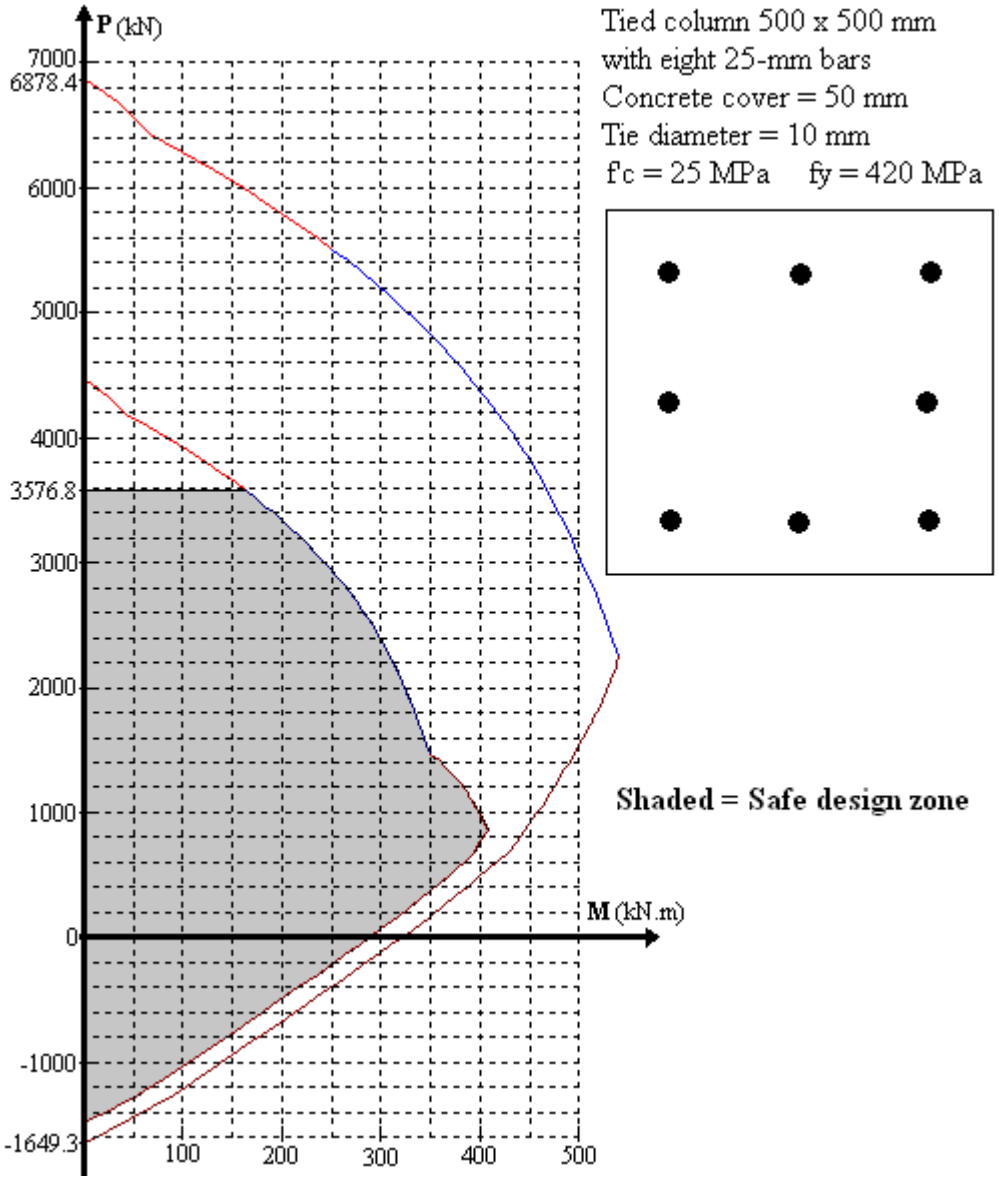

Figure 1: P-M interaction curve for the shown square column

Problem 2 (60%)

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 kN/m^2, Live load = 3 kN/m^2, Concrete unit weight = 24 kN/m^3

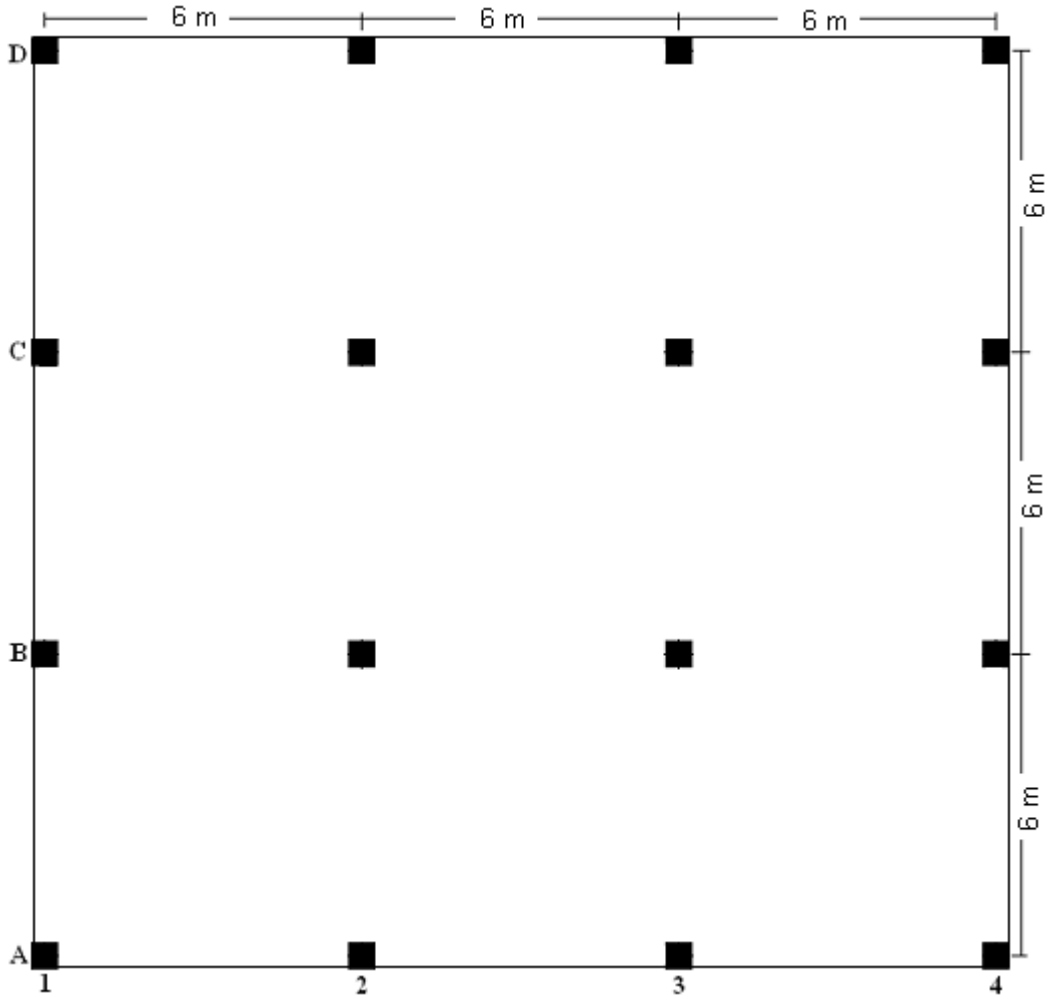

Figure 2: Floor with 3 x 3 similar panels

Flat plate

1) Determine the slab minimum thickness for deflection requirement.
2) Determine the shear panel dimensions and check the two-way shear for interior column C2, assuming an average steel depth of 168 mm.
3) Determine the static moment in the interior panel spanning between columns B2 and B3, as well as the negative and positive moments in the column strip.
4) Design the column strip for a moment of 200 kN.m using 12-mm bars

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 150 mm. All the beam sections are 300 x 600 mm. The moment of inertia of the interior beam (as a T-section) is: $I_b = 9.56x10^9\ mm^4$

5) Determine the relative interior beam stiffness α
6) Check the slab thickness for the interior panel B2-B3-C3-C2 assuming that $\alpha = 2.5$