Birzeit University
Faculty of Engineering and Technology
Department of Civil and Environmental Engineering

ENCE 436 Reinforced Concrete Design II

Term Project **Due Monday, May 31, 2021**

A building has outer dimensions of 45 m x 42 m and consists of seven stories (the same slab is repeated seven times.) The service dead load includes the weight of the slab only. The service live load W_{LL} = 5 kN/m^2. For all slab calculations, assume the column size is fixed at 70x70 cm^2. The building is adequately braced in both directions. Choose the spans such that all the requirements of the direct design method are satisfied.

Choose the material properties.

a) Choose the slab type: Flat slab, flat plate, or two-way slab on beams. It may be ribbed or solid. Determine the slab thickness for deflection and check its adequacy for shear.

b) Design a typical floor using the direct design method. Provide structural drawings to show your design.

c) Design one edge and one interior column for the bottom, and the top, floors. Note that the moments for the top floor are not divided by two. Modify the size of the column as appropriate to maintain a reinforcement level of about 2.0 %. Design the bottom floor columns as concentrically loaded then check for bi-axial bending and compression using the Bresler formula. Design the top floor columns for bi-axial bending and compression then check for concentric load capacity. Since the columns are square, they may be designed as tied columns or as spirally reinforced columns. Do not repeat any of the slab calculations. Each storey has a c/c height of 6.0 m. The self-weight of the columns must be added. Slenderness effects must be checked. The K factor must be determined using the graphs of the ACI-Code. For the calculation of ψ, assume that the slab with a width of 100 cm represents the framing beams. Do not adjust the self-weight or repeat the load calculations if a smaller column size is used.

d) Use the equivalent frame method and moment distribution to determine the longitudinal moments for one typical frame (one floor with one column above and below the floor), and for one case of loading only. Use proper values for the equivalent column.

e) Repeat the analysis using computer software.

f) Repeat the moment distribution analysis using the equivalent beam method.

g) Compare, in tabular form, the results for the longitudinal moments obtained using each of the four analysis methods.

You may work in groups of three or four only. Submit the project in PDF format, at the same course email address.