Assignment # 1
(50 marks Total)

Problem 1 (30 marks)

Consider the reinforced concrete floor plan shown in the figure below. The floor is subjected to a specified live load of 2.4 kPa and a specified superimposed dead load of 1.5 kPa (does not include self-weight). Knowing that the slab is made of normal-density concrete (24 kN/m^3) and the slab and beam dimensions are as indicated below:

a) Show the specified (unfactored) dead and live loading on a typical interior one-way slab in kN/m (spanning N-S), and then using program SAP2000 determine the shear and moment diagrams for this slab under the following load case: 1.25D +1.5L. Note: model the slab as a continuous beam using a 1 m wide strip as explained in tutorial 1.

b) Show the specified (unfactored) dead and live loading on a typical interior beam (spanning E-W) in kN/m , and then using program SAP2000 determine the shear and moment diagrams for this beam under the following load case: 1.25D +1.5L. Note: model the beam as a continuous beam on simple supports as explained in tutorial 1.

c) Does the depth of the interior one-way slabs (175 mm) and beams (500 mm) meet the minimum thickness/depth specified in Table 9-1 to avoid detailed deflection checks ?

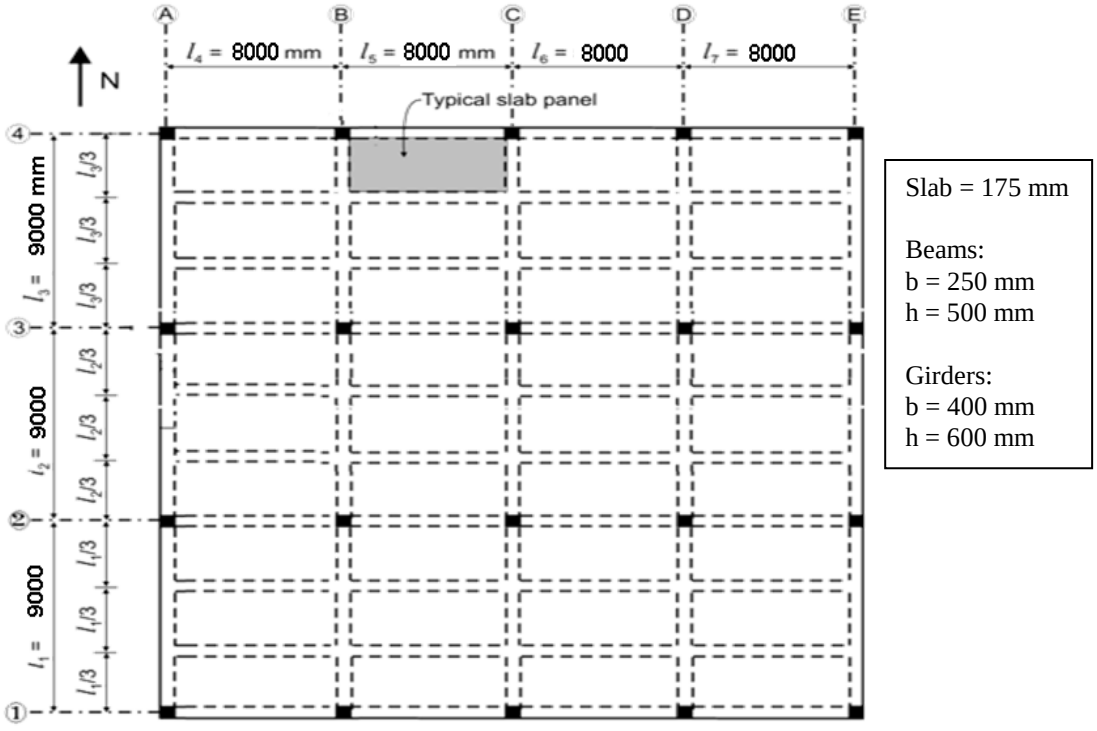

Figure 1

Problem 2 (20 marks)

For the beam having the rectangular cross-section shown in **Figure 2**:

i. determine the cracking moment, Mcr

ii. at M = 80 kNm, determine the stresses in the extreme compression fiber in the concrete and the stress in the steel reinforcement (assume stresses are still linear)

* use: f'c = 25 MPa, fy = 400 MPa, Es = 200 GPa, As = 4-25M bars

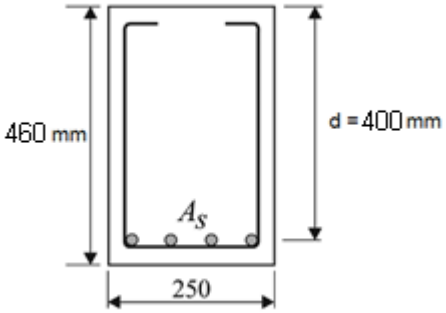

Figure 2