ENCE 335, Reinforced Concrete Design I

Homework assignment #1

Due on Saturday, Oct. 5th, 2019 @ 8:30 AM.

A beam extends over a span of 5 m and an overhang (cantilever) to the right of the right support of 2.5 m (that is, the total length of the beam is 7.5 m.) The beam supports a service dead load of 130 kN/m (self-weight not included), and a service live load of 100 kN/m. Assume the connection between the beam and the support is a simple pin or roller.

Prepare your work according to the following steps:

1. Draw the shear (V_u) and bending moment (M_u) <u>diagrams</u> for the beam including the beam self-weight. <u>Note that there will be a maximum positive and a maximum negative moment.</u>

2. Use the larger of the two maximum moments (absolute value) to determine the required dimensions for a reinforcement ratio <u>within the recommended range</u>. Select the dimensions such that the effective depth (d) is within the recommended range. Use multiples of 5 cm for h and b.

3. Select the reinforcement required at two locations using these dimensions: for the maximum positive and the maximum negative moment. perform all the necessary checks. (two moments need be designed)

4. Present your design using side views, sections, and details as appropriate.

5. Calculate the cracking moment of each section and compare it with ultimate bending moment (M_u).

6. Calculate the stresses (comp. and tension) under service load conditions. (Calculate the maximum service moment, i.e.: service loads without factors)

Use fc' = 28 MPa, fy = 420 MPa, $\gamma_{concrete}$ = 24 kN/m^3.