

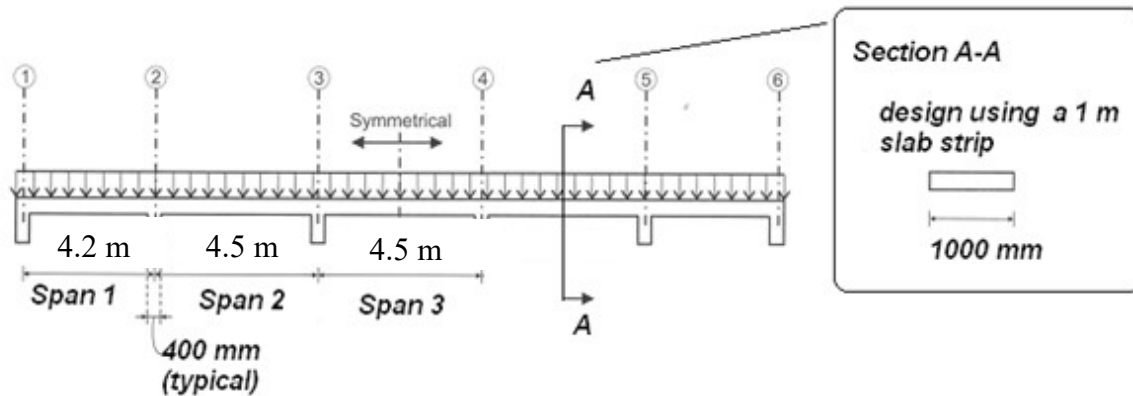
## Assignment #8

2 Questions, Total = 60 MARKS

**Problem 1 (40 marks)**

Consider the one-way slab that is shown in the figure below. The slab has a thickness of **225 mm** and is subjected to a unfactored superimposed dead load of **5 kPa** (in addition to its self-weight - **don't forget to include self-weight!**) and a unfactored live load of **7 kPa**. The supporting beams are 400 mm wide.

The designer has specified the use of  $f_c' = 30 \text{ MPa}$ , 400W steel ( $f_y = 400 \text{ Mpa}$ ), **20 mm** cover, and the use of **15M bars** for the slab reinforcement. Treat the end spans as being **unrestrained**.



- Show that this slab can be analyzed using the CSA A23.3 approximate frame analysis method, then determine the factored bending moments and factored shears using this method.
- Design the flexural reinforcement for **span 2 only** using the moments found in “a”
- Design the temperature and shrinkage reinforcement (use 15M bars)
- Summarize the layout of the reinforcement for span 2 using a neat sketch
- Check that the shear resistance is sufficient without the need to add additional shear reinforcement
- Check whether the slab thickness of **225 mm** is sufficient to avoid detailed deflection calculations

**Problem 2 (20 marks)**

Consider the cantilever floor **slab** which is shown below which has a thickness of **200 mm**, **span of 2 m** and is supported by a reinforced concrete wall. The slab is subjected to a factored uniform load ( $w_f = 9 \text{ KN/m}$  per 1 m width, which includes self-weight) and is reinforced with **15M** bars at a **300 mm** spacing (15M @ 300 mm).

Regular uncoated reinforcement is used in the design, and  $f'_c = 25 \text{ MPa}$ ,  $f_y = 400 \text{ MPa}$ .  
Clear cover is 30 mm.

- Draw the moment diagram. Where is the point of maximum stress? Is the amount of tension reinforcement provided adequate (only check the tension steel, i.e. show that:  $M_r \geq M_f$  and verify that spacing meets the  $A_{smin}$  and  $s_{max}$  requirement of the code).
- Determine the minimum development length required by the CSA A23.3 standard for the bars if they are kept straight so that they are properly anchored in the wall. Show a summary of your design on a sketch.
- Design a hooked bar anchorage as an alternative solution. Show a summary of your design on a sketch.

