# FACULTY OF ENGINEERING AND ARCHITECTURE
# AMERICAN UNIVERSITY OF BEIRUT
**Department of Civil & Environmental Engineering**

## CE073 - Reinforced Concrete I
**Quiz I**

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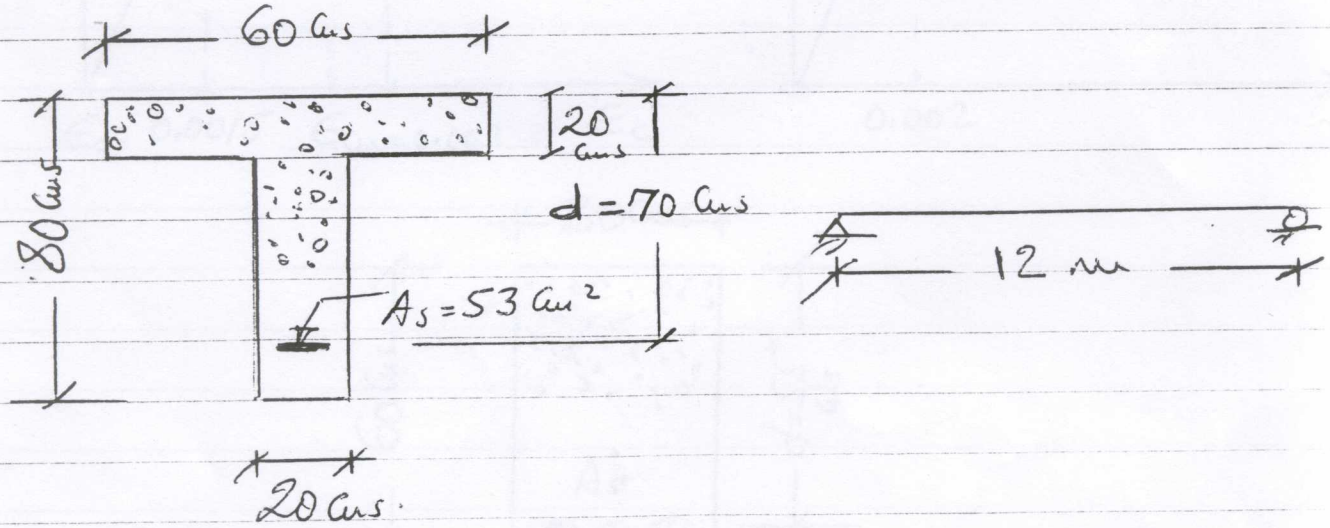
Time = 90 minutes
Closed Book and notes
Use of Programmable Calculators is not allowed

**Problem No. I (45%)**

Give the simply supported T beam with section dimensions and reinforcement as shown in the figure below. $f'_c$ = 210 kg/sq.cm; $f_y$ = 4200 kg/sq.cm.

1. Calculate the nominal flexural strength of the beam in accordance with ACI 318-95.
2. If superimposed dead load ($W_S$) = 2.5 T/m, what is the maximum uniformly distributed live load $W_L$ that the beam can support to still satisfy the ultimate flexural strength requirements of the ACI building code.
3. Given $W_L$ = 1.25 T/m. Calculate the **service** load stresses in the steel and concrete caused by **live load** alone (assume $n = E_S/E_C = 8.0$).



**Problem No. II (35%)**

Design a simply supported R/C beam with rectangular cross section, and span length = 10 m. Given: superimposed dead load = 2.5 T/m; live load = 1.0 T/m.

**Note:** You are free to select any design method provided that the beam satisfies the ACI code serviceability (deflection), and maximum and minimum reinforcement requirements.

**Problem No. III (20 %)**

Given the idealized stress-strain curves of concrete and steel and the reinforced concrete section as shown in the figure below. **NOTE: DO NOT USE WHITNEY APPROXIMATION OR THE ACI BUILDING CODE APPROACH.**

Using the stress-strain curves, calculate the area $A_S$ of reinforcing steel such that the N.A. depth at nominal flexural strength ($\varepsilon_C = \varepsilon_{cu} = 0.003$) of the section is equal to 20 cms. Compute accordingly the nominal flexural resistance of the section.

**Good Luck**