Mansoura University
Faculty of Engineering
Structural Eng. Dept. (Reinforced Concrete Structures)

2rd Year Civil
June 2010
Time: 3 hours
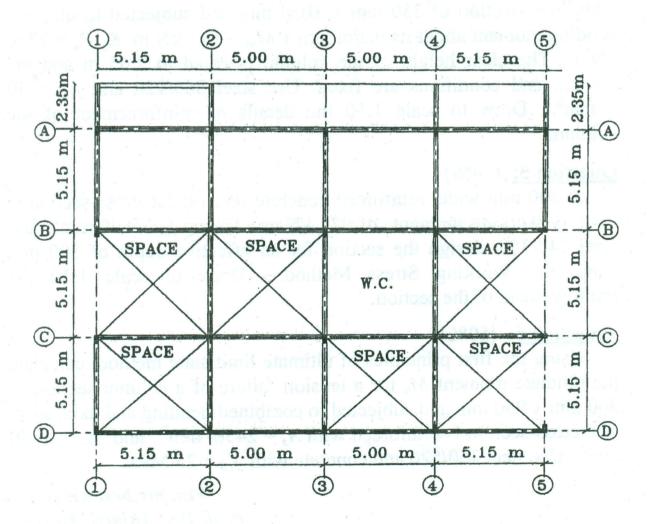
Notes: 1. Any missing data is to be reasonably assumed.
  2. Design Aids can be used.
  3. The Exam consists of 2 pages.

Question 1: (40%)

The plan shown in the Figure is the roof of a one story R/C building. Assuming the slab live load is equal to 6.0 kN/m^2 and the covering materials is equal to 1.5 kN/m^2, it is required to:

1) Design the solid slabs of the roof Using steel 240/350 and concrete with $f_{cu} = 25$ MPa. (15%)

2) Draw the reinforcement of the designed slabs to scale 1:50. (7%)

3) Design the beam on axis 1-1 for flexure. Draw the moment of resistance diagram and the details of reinforcement of this beam. (18%)

Question 2: (20%)

A simply supported beam of 300 mm wide having an effective depth of 850 mm and the slab thickness is 120 mm carries a total factored load of 515 kN/m' on a clear span equal to 12.50 m. It is reinforced with $18\phi25$ as a tensile steel. The design characteristic strength of concrete is equal to 30 N/mm^2. Draw the diagonal tension diagram for the beam and design the beam for shear using stirrups and bent bars.

Question 3: (10%)

Determine the reinforcement to be provided in unbraced reinforced concrete member with cross-section of 250 mm x 1450 mm and subjected to ultimate bending moment about its major axis ($M_{ux} =$ 575 kN.m   and $P_u = 3050$ kN). The clear height of the member is equal to 9.25 m. Use steel 240/350 and $f_{cu} = 25$ N/mm^2. Draw to scale 1:10 the details of reinforcement.

Question 4: (10%)

Determine the reinforcement to be provided in braced column with cross-section of 250 mm x 1050 mm and subjected to ultimate bending moment about its major axis ($M_{ux} = 515$ kN.m & $P_u = 2750$ kN).   The clear height of the column is equal to 7.65 m and the column end conditions are fixed. Use steel 360/520 and $f_{cu} = 30$ N/mm^2.   Draw to scale 1:10 the details of reinforcement of the column.

Question 5: (10%)

A 300 mm wide, reinforced concrete rectangular cross-section is to carry working moment of 975 kN.m. Taking $f_{cu} = 30/$mm^2 and steel 240/350, design the section for an effective depth of 500 mm using the Working Stress Method.   Draw to scale 1:10 the reinforcement of the section.

Question 6: (10%)

Using the first principles of ultimate limit state method, calculate the ultimate moment M_u for a tension failure of a column section of 300 mm x 950 mm and subjected to combined bending and axial load. The cross-section is reinforced with $A_s = 2450$ mm^2 and $A_s^` = 1350$ mm^2. Use steel 360/520 and concrete with $f_{cu} = 25$ MPa.

With my best wishes,
Prof. Dr. Ahmed Yousef