

- ❖ Any missing data may be reasonably assumed.
❖ Concrete characteristic strength for all reinforced concrete members, $f_{cu} = 25 \text{ N/mm}^2$.
❖ Grade of reinforcing steel is 360/520 for main steel and 240/350 for stirrups.
- الإمتحان مكون من ورقتان ... مسموح بإصطحاب الجداول و مساعدات التصميم

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Question No. 1 (15 degrees)

a) Choose the correct answer:

- 1- **Braced building usually have:**
 - a- RC walls in ground floor.
 - b- RC walls extending the full height of the building.
 - c- RC walls in ground floor connected to foundation.
- 2- **In RC tied columns, the maximum spacing between stirrups should not exceed:**
 - a- 15 times the largest diameter of any longitudinal bar but not more than 200 mm.
 - b- 15 times the smallest diameter of any longitudinal bar but not more than 200 mm.
 - c- 15 times the smallest diameter of any longitudinal bar but not less than 200 mm.
- 3- **1) The Egyptian code states that the maximum spacing between main steel bars in solid slabs should not be more than:**
 - a- twice slab thickness. 1.35
 - b- 200 mm.
 - c- the least of them.
- 4- **Solid slabs is supplied with shrinkage reinforcement when:**
 - a- thickness of slabs exceeds 160mm
 - b- thickness of slabs equals 160mm
 - c- thickness of slabs in the range of 160mm
- 5- **The Egyptian code states that the minimum diameter of straight bars used in solid slabs is**
 - a- 6 mm
 - b- 8 mm
 - c- 10 mm

b) State which of the following is true and correct the false one:

- 1- The minimum number of longitudinal bars in a square column of 400 mm side length is 4 bars
- 2- Maximum longitudinal reinforcement for a corner column is 6%.
- 3- Long term deflection may be minimized by using compression reinforcement.
- 4- The code requirements for minimum reinforcement in short tied rectangular columns 1 % A_c .
- 5- Spirals increase the carrying capacity of a column by 40%.

Question No. 3 (60 degrees)

For the part of the structural plan of a residential building shown in figure (1); if you know that: the building consists of 10 floors (Ground + 9 floors) , Height of ground floor = 4.50 m , Height of typical floor height = 3.0 m, floor cover = 1.50 kN/m², L.L. = 3.00 kN/m², Walls exist over all beams with intensity 3.00 kN/m², all beams' cross section 250 × 600 mm, Hatched slab is 100 mm lower than the rest of the floor, All Columns are Fixed at Foundations.

it is required to:

1. Design the necessary critical sections for the shown solid slabs at section I-I. Draw neatly, to a convenient scale on plan, the details of reinforcement for all shown slabs.
2. With a reasonable scale, Sketch without any calculations all details of reinforcement of the continuous beam on axis (3 - 3) in elevation and cross sections.
3. Check deflection for simple beam (B) on axis (2-2) at the maximum stressed section.
4. Design the column C1 at ground floor level as a square tied column.
5. Re-design the column C1 at first floor level as a circular spiral column and suggest with neat sketch the transfer connection between the ground and first floor for this column.
6. Design the column C2 at ground floor level as a rectangular tied column with limited width = 300 mm
7. If, for some reason, column C3 is subjected to external moments $M_x=300\text{kN.m}$ and $M_y=250\text{ kN.m}$, design column C3 to accommodate the vertical load at the fourth floor in addition to these moments and then draw a cross section showing the details of its reinforcement.

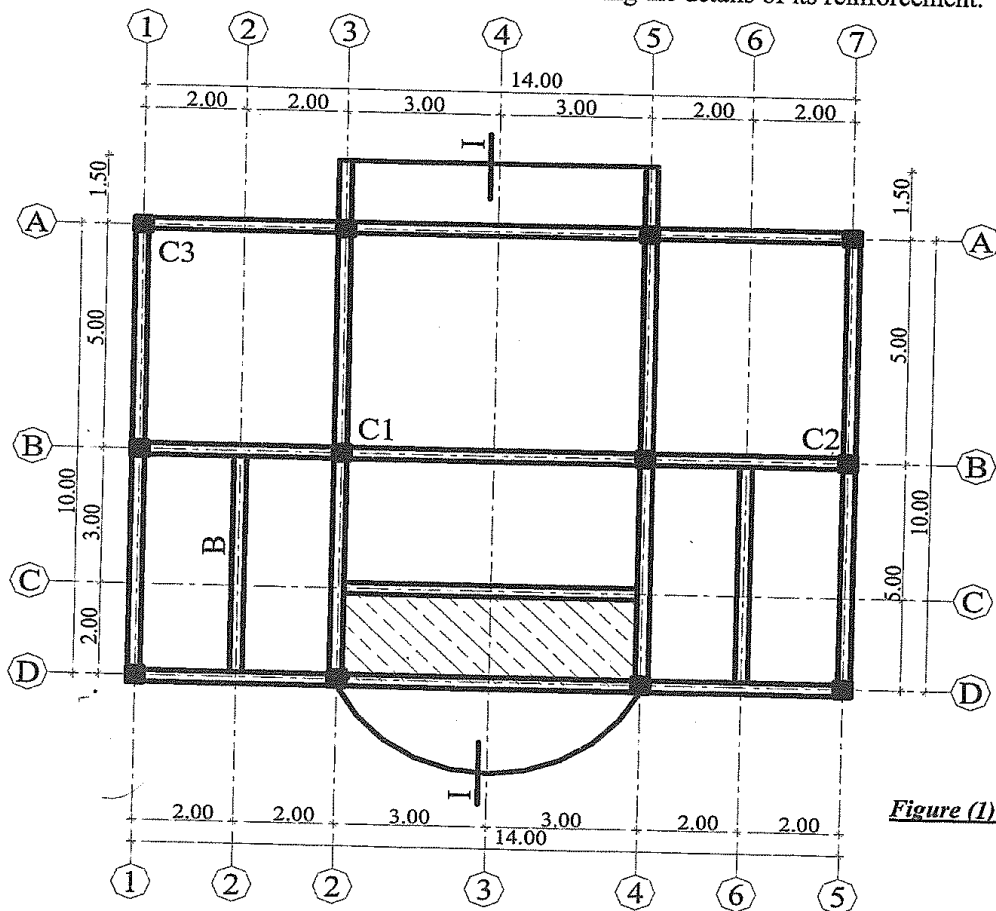


Figure (1)