Question 1: (50%)  
The given plan shows the layout of a roof system. The part of the roof between axis 5-5 and axis 7-7 (including the cantilever) is to be designed as hollow-block slabs using hidden beams system. The design concrete characteristic strength is equal to 30 MPa and the main steel used is 360/520. The height of the story is 4.25 m. The live load is 8.50 kN/m² and the flooring cover is 2.00 kN/m². It is required to:
1- Design a two way hollow-block slabs for the part of the roof between axis 5-5 and axis 7-7 using Hagarit blocks of dimensions 20x20x40 cm. Draw to a suitable scale the details of reinforcement of the slabs. (15 %)
2- Design the hidden beam on axis 7-7 and draw to a suitable scale the details of reinforcement of this beam. (10 %).
3- If the part of the roof between axis 1-1 and axis 4-4 is to be designed as continuous paneled beams, it is required to design the most critical paneled beam. Draw to scale 1:100 the details of reinforcement of this beam. (15％)

For a hinged-fixed beam:  
\[
\frac{\delta_h}{\delta_{\text{max}}} = \frac{185}{48} \left\{ \frac{x}{L} - 3 \left( \frac{x}{L} \right)^3 + 2 \left( \frac{x}{L} \right)^4 \right\}
\]

For a fixed-fixed beam:  
\[
\frac{\delta_f}{\delta_{\text{max}}} = 16 \left( \frac{x}{L} \right)^2 \left\{ 1 - 2 \left( \frac{x}{L} \right) + \left( \frac{x}{L} \right)^2 \right\}
\]

4- In one of the spaces, arrange a cantilever stair consisting of two flights. The width of the step is 2.15 m. Design the stair and draw the reinforcement details. (10 %)