Notes: 1. Any missing data is to be reasonably assumed.
2. Design Aids can be used.
3. Total Grade is 70 points.

Figure 1 shows the layout of a roof system. The live load is 5.0 kN/m² and the flooring cover is 2.00 kN/m². Using steel 360/520 and concrete with design characteristic strength $f_{cu} = 35$ N/mm², it is required to:

**Question 1: (20 points)**

If the part of the roof between axis 1-1 and axis 2-2 is to be designed as paneled beams, draw to a suitable scale the plan of the roof and design the most critical paneled beam. Draw the details of the beam.

**Question 2: (20 points)**

Design a two way hollow-block slabs for the part of the roof between axis 5-5 and axis 7-7 (including the cantilever) using Hagarit blocks. Draw to a suitable scale the details of reinforcement of the slabs.

**Question 3: (20 points)**

Design the internal middle strip in the horizontal direction between axis B-B and axis C-C. Draw to a suitable scale the details of reinforcement.

**Question 4: (10 points)**

Arrange a cantilever stair consisting of two flights in the spacing between axis 2-2 and axis 3-3. The width of the flight is 2.65 m. Design the cantilever stair and draw to suitable scale the details of reinforcement.

Fig. 1

*My best wishes, Prof. Dr. Ahmed Yousef*