GX486

OLLSCOIL NA hÉIREANN, GAILLIMH
NATIONAL UNIVERSITY OF IRELAND, GALWAY

SEMESTER I EXAMINATIONS, 2000
THIRD ENGINEERING

DESIGN OF CONCRETE STRUCTURES

Professor R. A. Falconer;
Prof. P. O'Donoghue;
E. Cannon, BE DipIng DIC MSc.

Time allowed: ***2 hours***

Answer ***four*** questions

Notes

1. The use of BS8110 is allowed in the examination, as are non-programmable calculators.
2. Where you are asked to provide **reinforcement details**, a neat sketch will suffice, showing bar layout and indicating curtailment locations. No bar marks or schedules are required.
3. Attention should be paid to neat and orderly presentation; marks will be deducted for untidy and badly presented work.
4. Unless otherwise indicated:
   - all dimensions in mm.;
   - exposure conditions mild;
   - required minimum fire resistance period is 1 hour;
   - characteristic strengths of materials are as follows:

concrete		$f_{cu} = 30$ N/mm^2
steel reinforcement		
	longitudinal	$f_y = 460$ N/mm^2
	shear	$f_{yv} = 250$ N/mm^2

1. The continuous one-way spanning slab shown in Fig. Q1 spans onto walls at 4.8m centres. The 175 thick slab carries a characteristic imposed load of 3.5 kN/m^2, uniformly distributed, in addition to self-weight. Design flexural reinforcement for the slab and check its adequacy as regards shear and deflection.

   Sketch, in plan and section, a suitable arrangement of reinforcement in the slab.

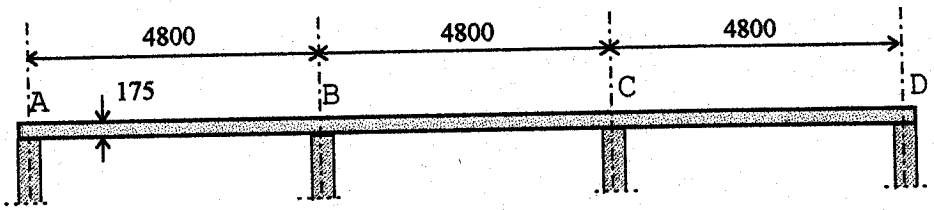


Fig. Q1

2. A simply-supported precast concrete beam, 450mm wide by 1000mm deep, has an effective span of 13.5m. It is required to carry a characteristic imposed load of 50 kN/m, uniformly distributed over the span, in addition to its self-weight,. Design flexural reinforcement for the beam, and check its adequacy as regards deflection. Sketch, in elevation and section, the arrangement of longitudinal reinforcement.

3. A simply supported reinforced concrete beam spans 15m centre-to-centre of supports, and carries a characteristic imposed load of 80 kN/m in addition to self-weight. If the beam is 400 wide and 1000 deep overall, design suitable shear reinforcement. Bottom reinforcement at midspan consists of 10T32, in two equal layers, one of which is curtailed at a distance of 0.08L from centres of supports. Assume supports to be 300 in width.

4. Fig. Q4 shows an edge section for a suspended r.c. floor, which has an effective span of 7.5m. The floor is of beam-and-slab construction, having an overall depth of 450. Beam ribs are 300 in width and spaced at 3600 centres.

   If the slab supports a characteristic imposed loading q_K of 3kN/m^2, design flexural reinforcement for the beam on grid-line C. Check the adequacy of the beam as regards deflection.

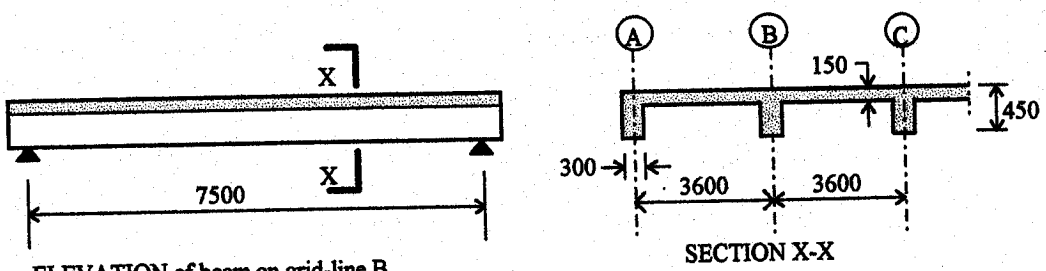
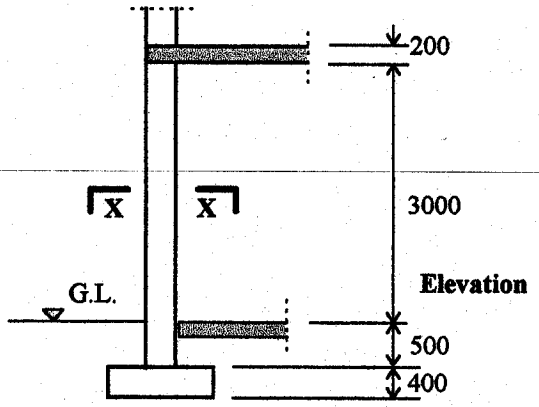


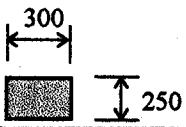
Fig. Q4

5. The braced column shown in Fig. Q5 is 225 x 300 in cross section. The r.c. floors which it supports are 200 thick flat slabs. The column is required to support ultimate loading as follows, between foundation and first floor level:

- axial compressive force: 675 kN
- bending moments about both axes:
  120 kNm about the major axis
  50 kNm about the minor axis.

Design the column at this level, and sketch reinforcement details, including details at intersections with first floor slab and with the foundation pad.





Section X-X

Fig. Q5