GK482

OLLSCOIL NA hÉIREANN, GAILLIMH
NATIONAL UNIVERSITY OF IRELAND, GALWAY

SEMESTER I EXAMINATIONS, 2000

B.E. DEGREE

DESIGN OF CONCRETE STRUCTURES

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Time allowed: 2 hours

Answer ***two questions*** - Question 1 (30 marks) and *either* Question 2 or Question 3 (20 marks)

1. The use of *Extracts from British Standards for Students of Structural Design* is permitted. Alternatively, BS8110 and BS6399 may be used.

2. (a) All dimensions are in mm., unless noted otherwise.
For Q1 and Q3 assume mild conditions of exposure, and a 1 hour fire resistance period.
For Q2, assume severe conditions of exposure, and no fire resistance requirement
Concrete grades will be the minimum required for these conditions.
$f_y = 460$ N/mm^2 for longitudinal reinforcement and
$f_y = 250$ N/mm^2 for shear reinforcement.

(b) For Question 1 reinforcement detailing must be sufficient to permit scheduling. Less detail is expected in Q2 and Q3. Neat pencil sketches will be adequate for all questions.

(c) In this examination, soundly based *approximate* calculations combined with sketches (and schedules where called for) are preferable to highly detailed calculations submitted without accompanying drawings. Exercise engineering judgement, where necessary, to progress a design.
Avoid unnecessary iteration or refinement of calculation in the examination.

Answer Question 1 and *either* Question 2 or Question3

1. Fig. 1 shows part of the grid for a multi-storey office building. The in-situ floor may consist of a slab supported on a two-way grid of beams or, alternatively, a flat slab. Select suitable dimensions for members and:

(a) Design, detail and schedule slab panels B1- C3 (shaded);

(b) Calculate loads on beam span B2-C2 and from this *estimate* loadings on span A2-B2. Assuming the beam to be symmetrical about grid-line D:

- design, detail and schedule the beam (or beam strip) over length A2-C2.
- sketch the load cases you would consider for a detailed computer analysis, indicating, for each case, the sections at which it is expected to produce maximum or minimum effect.

(c) Determine, *approximately*, ultimate and service loadings, per floor, on columns B2 & A1. Slab loadings are as follows:

floor finishes	1.25 kN/m^2
mechanical & electrical services	0.35 kN/m^2
false ceilings	0.20 kN/m^2
removable partitioning	1.00 kN/m^2
imposed floor loading	3.0 kN/m^2

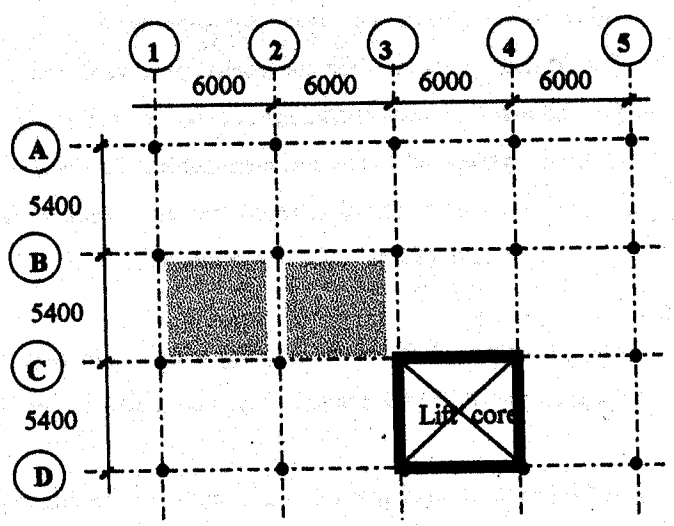

Fig. 1

2. (a) Fig. Q2 shows a reinforced concrete platform consisting of a 200 slab supported on beams and supported on corner columns. The structure is braced by shear walls (not shown). Each column carries an ultimate load, P_u, of 1200 kN from above in addition to loading from the slab at this level. Design ultimate loading for the slab is 16 kN/m^2 (including slab self-weight).

Determine the bending moments imparted by the beams to the columns supporting the slab, assuming these moments to amount to FL/20 in each case, F being the total loading and L the corresponding value of effective span length. Design reinforcement for the column over the length shown.

(b) Piled foundations are being considered for each of the columns, with permissible service load per pile of 400 kN. Design a suitable pile cap.

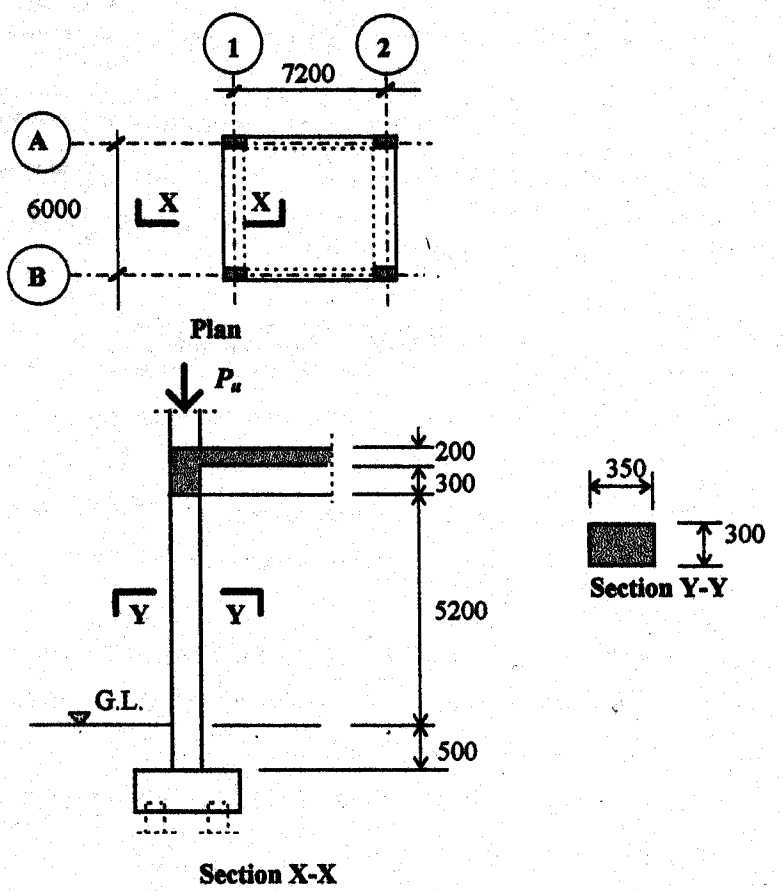

Fig. Q2

3. (a) With reference to retaining walls, discuss, briefly, each of the following:

buttressed wall, counterfort wall, gabion, crib walling, shear key, caisson, coefficient of earth pressure at rest, effective back of wall, batter, drainage

(b) A wall is required to retain backfill and a uniformly distributed surcharge as shown in Fig. Q3. Determine suitable dimensions for the wall. Calculate, and detail in a neat sketch, reinforcement for stem and base. No bar schedule is required.

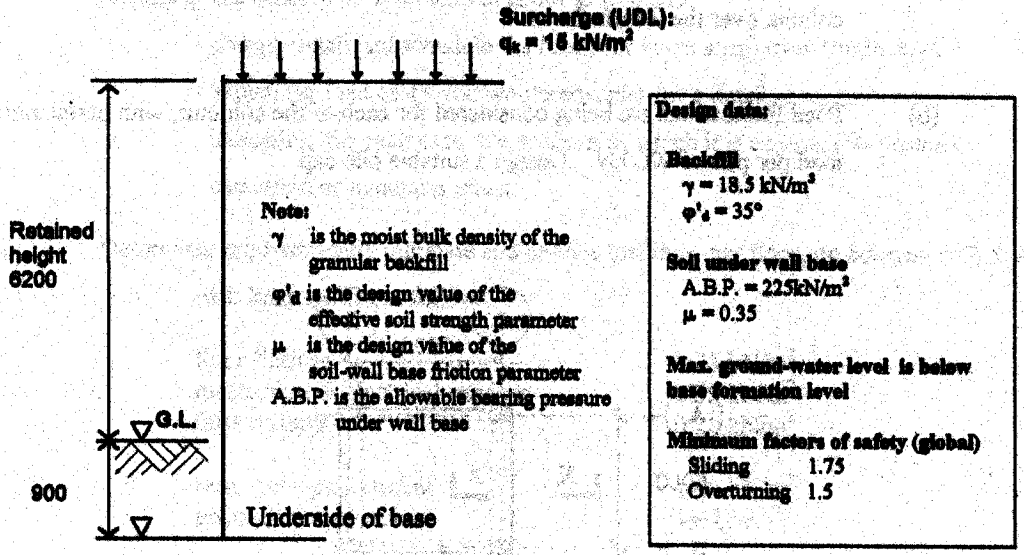

Fig. Q3 Wall and soil data