Concrete Structures Coursework 2023 (To be done in groups of 4 or 5)

Your brief is a shortened version of the Structural Concrete 24 design competition.

Your submission will comprise:

i. A conceptual design report
ii. Appendix 1 containing calculations for a flat slab scheme
iii. Appendix 2 containing the drawings for a flat slab scheme

Conceptual design report (20 pages groups of 4 & 25 pages groups of 5)

A maximum of 20 pages, of either 1.5 line spaced text in a maximum 11pt font, or neatly hand written in black ink, which should include:

i. An appraisal of two distinct and viable design solutions in structural concrete for the building, together with their associated slab, beam, column, wall and roof layouts (one solution should be a flat slab). The appraisals should comprise sketches of typical bays with supporting notes, outlining the intended load paths, framing and stability functions, and some brief notes on construction methodology. The appraisal should include consideration of any uplift forces on the structure. (The lightweight roof over the atrium is not part of your brief). (Initial sizes can be determined from Economic Concrete Frame Elements or simplified sizing methods from the IStructE EC2 design manual)

i. An evaluation of the merits and disadvantages of the two solutions. The evaluation should identify significant differences such as cost, buildability and material efficiency between the two alternatives, and make a recommendation in favour of one solution.

ii. A description of the foundation scheme adopted for the preferred solution, with a rationale for the selection. A fully detailed design for the foundation scheme is not required.

iii. A method statement for a safe construction procedure for the building. (Groups of 5)

Calculations (for flat slab scheme) (15-20 pages)

The verification of structural viability of the flat slab scheme should be demonstrated in an Appendix to the conceptual design report to make up the balance of the report. (The maximum total length of the conceptual design report and calculations is 35 pages A4. This does not include references or title pages.) The Appendices should contain sufficient design calculations by hand to establish the form and size of key structural elements for the chosen scheme. You should decide how best to convey this information within the space constraints imposed. Calculations for individual elements should enable a checker to understand clearly their contribution to the strength and stability of the whole structure, and the load paths assumed. Hence, if computer output is presented (I'm not expecting this), validation by (approximate) hand calculations is also required. Consideration should be given to performance at both Serviceability and Ultimate Limit States.
Note: Calculations are not required for stairs, basement or foundation.

Drawings

A total of three A3/A4 drawings should be included. Drawings may be prepared using appropriate CAD software, or by hand. In either case, notes and dimensions should not be smaller than the equivalent of an 11pt font. These drawings need not be counted in the 35-page limit. Two of the A3

drawings should be used to present general arrangements, sections and elevations of the building to show the layout, disposition and dimensions of structural elements for estimation purposes. Drawings should be to an appropriate scale and must be dimensioned. Reinforcement details should not be shown on these two drawings. The third drawing should show typical reinforcement details for the flat slab. Include in your drawing details of the flexural reinforcement at internal, edge and corner columns, as well as if required punching shear reinforcement at a typical internal column.

Note page limits are indicative but try not to exceed.

Hints: For second scheme consider alternative column grid and structural solution but do not change shear wall arrangement. Use tabulated coefficients to calculate moments in beams and slabs.