NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF THE BUILT ENVIRONMENT

DEPARTMENT OF QUANTITY SURVEYING

ASPECTS OF STRUCTURAL DESIGN

BCS 2102

Supplementary Examination Paper

August 2024

This examination paper consists of 5 printed pages

Examiner's Name : **Eng. M.F Mudhindi**

Time Allowed : **3 hours**

Total Marks : **100**

Special requirements : **BS 8110-1:1997**

Graph Paper

INSTRUCTIONS

Candidates should attempt **any four (4) questions**.

MARK ALLOCATION

QUESTION	MARKS
1	25
2	25
3	25
4	25
5	25

Question One

(a) Giving examples, differentiate between imposed and dead loads [5 marks]

(b) The four –span slab shown in **figure 2** below supports a live load of 1.75 kN/m2 plus finishes and ceiling loads of 1.5 kN/m2. Assume 2hr fire resistance and mild exposure.

fcu =35mPa and **fy**=460mPa, **fyv**=250 mPa.

The slab Thickness is 200mm, columns are 300 x300.

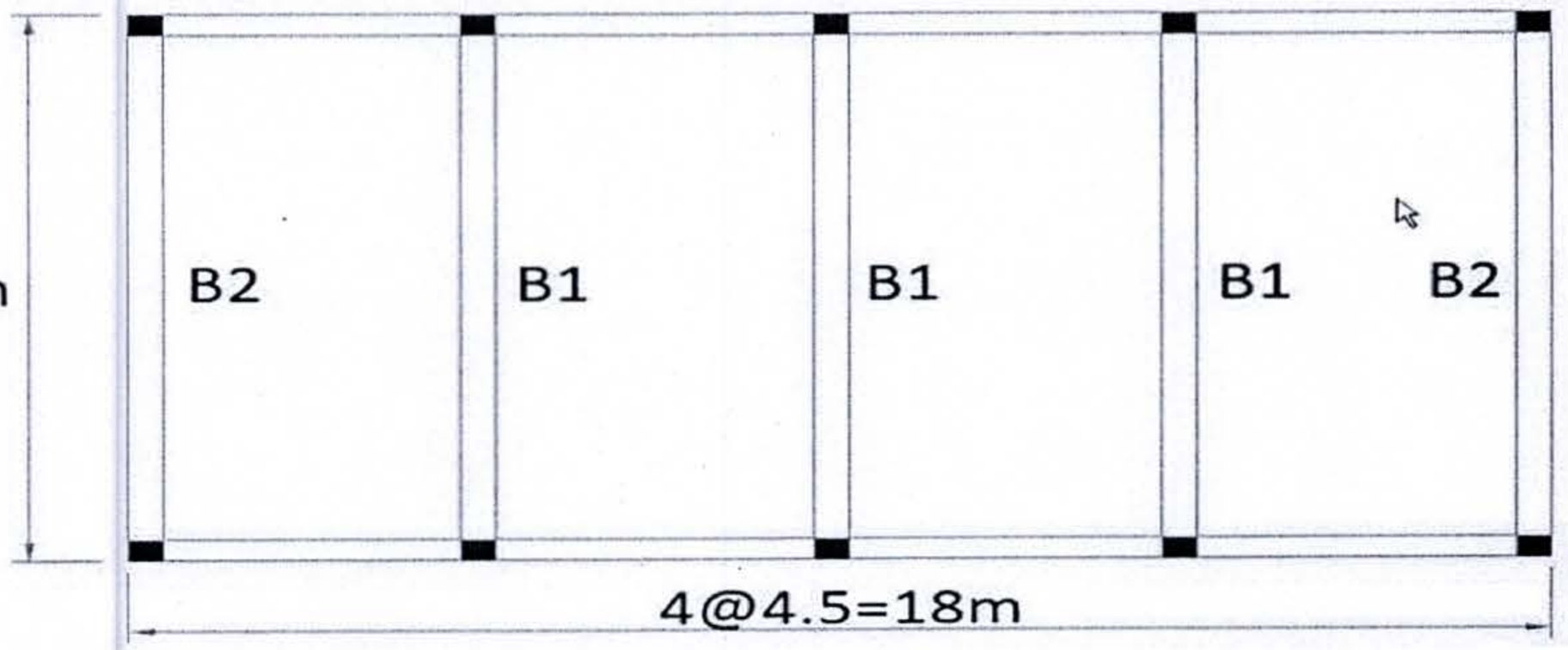

Figure 2

Design the beam B1 [20 marks]

Question Two

(a) For the beam and loading shown in **figure 1a**,

I. Calculate the reactions at the supports [3 marks]

II. Draw the shear force and bending-moment diagrams [10 marks]

III. Determine the maximum absolute values of the shear and bending moment [2 marks]

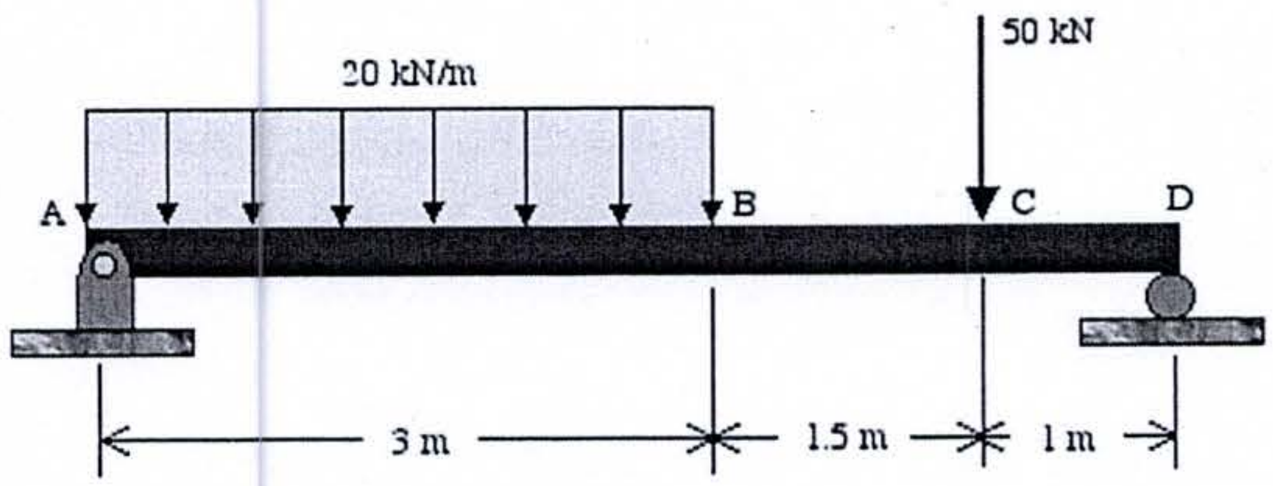

Figure 1a

(b) Locate the centroid of the steel girder shown in **Figure 1b** [10 marks]

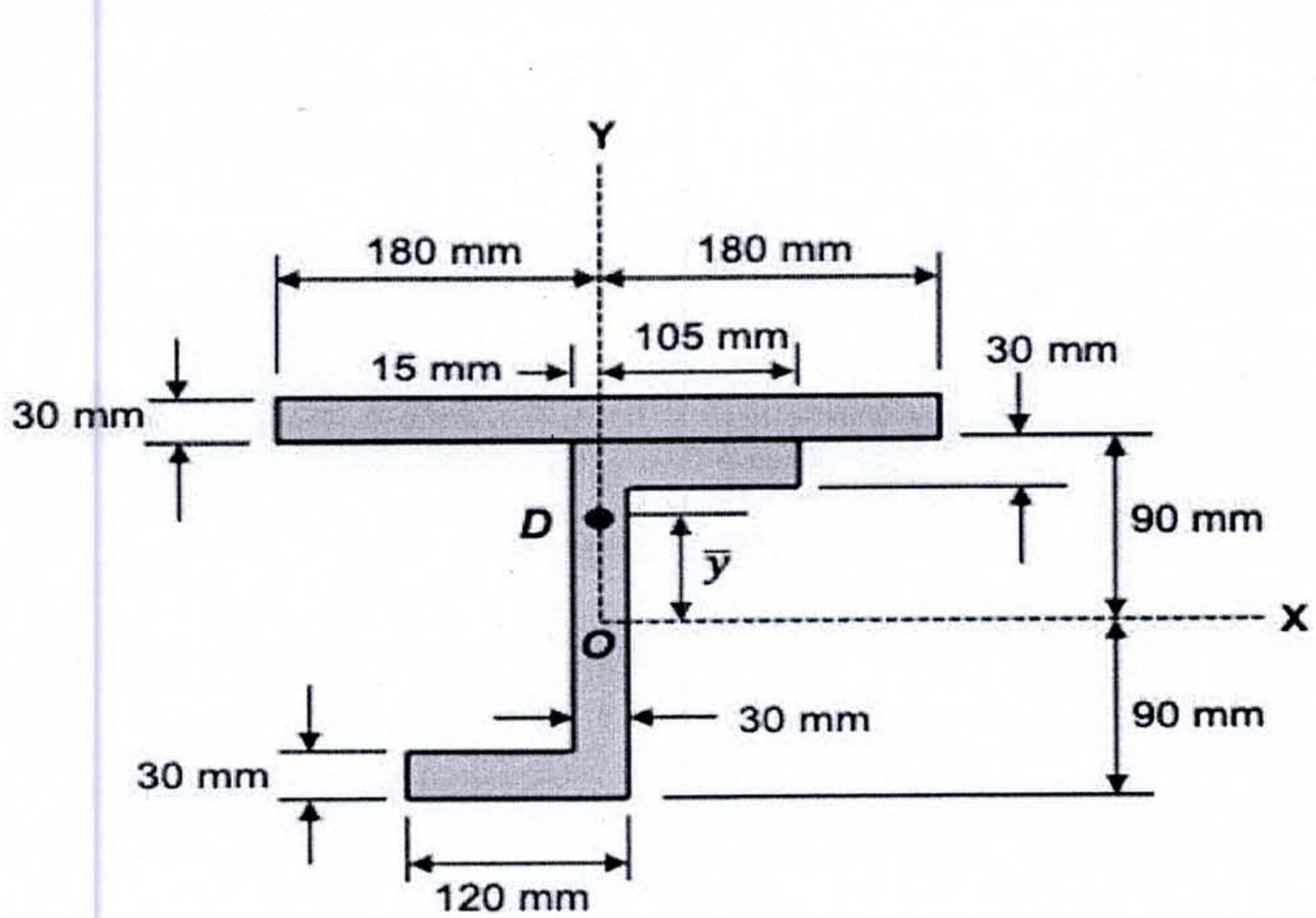

Figure 1b

Question Three

A column 500 mm × 500 mm carries a dead load of 970 kN and an imposed load of 560 kN. The safe bearing pressure is 300 kN/m2. fcu = 30 MPa and fy = 460 MPa. The exposure class is mild. Fire resistance = 2 hour. As the concrete is cast against a blinding layer, the cover is taken as 50 mm. **Design a square base to resist the loads**. [25 marks]

Question Four

Beam B1 shown in **figure 3** below is 330mm wide by 600 mm depth with 3 equal 5m spans. In the transverse direction, the beams are at 4m centre to centre with a 150mm thick slab. The live load on the beam is 65Kn/m and the dead load including self-weight is 90kN/m. fcu=35mPa, fy=460mPa and fyv=250mPa. Assume mild exposure and 2hr fire resistance. All columns are 300x300mm.

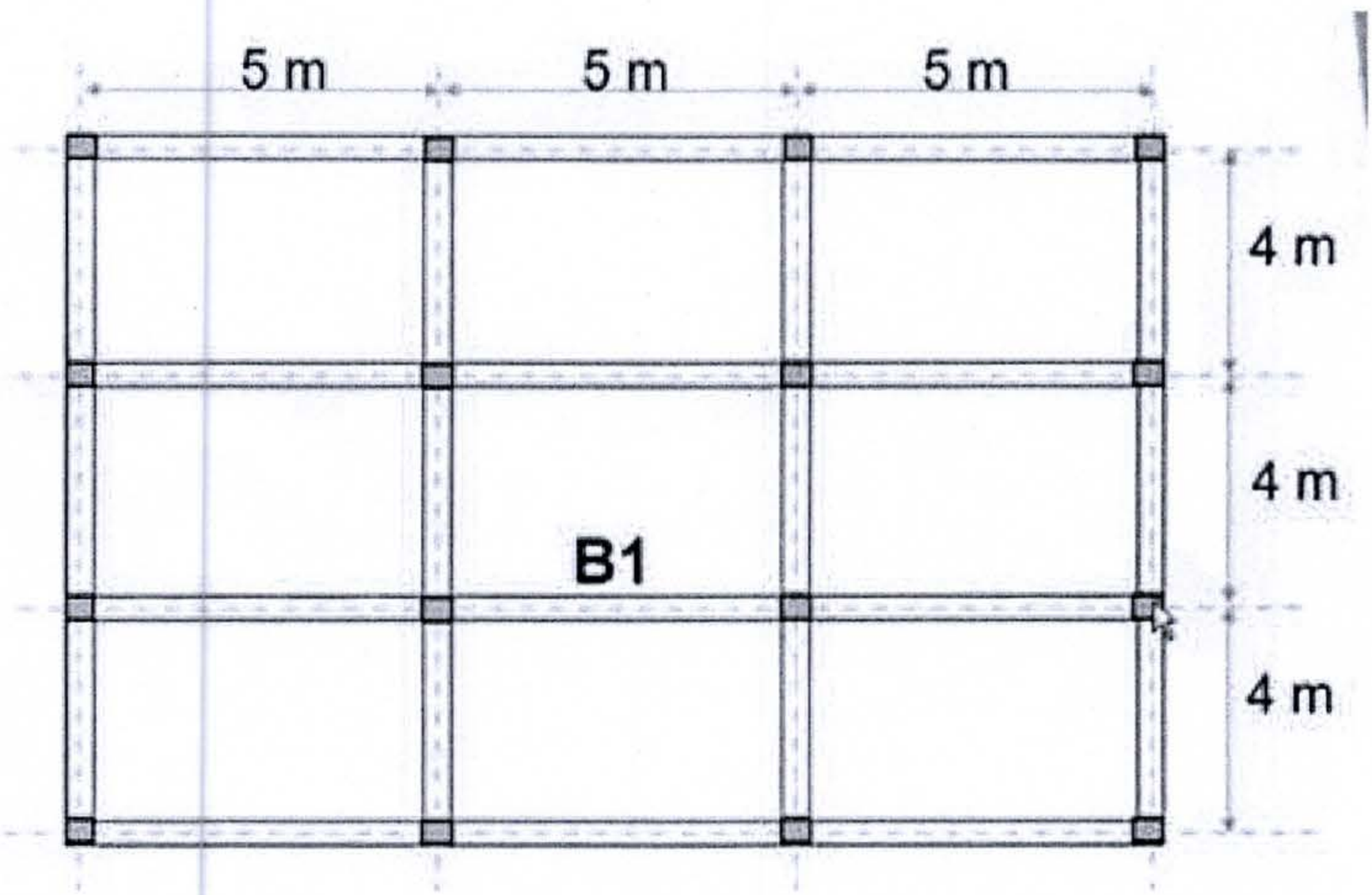

Figure 3

Design the beam B1 [25 marks]

Question Five

A continuous one-way slab has four equal spans of 4.0 m each. The slab depth is assumed to be 185 mm. The loading is as follows: Dead loads due to self–weight, screed, finish, partitions, ceiling: 6.2 kN/m2, imposed load: 4.3 kN/m2 The materials strengths are: concrete, fcu = 30 MPa, reinforcement, fy = 460 MPa. The condition of exposure is mild. Fire resistance = 1 hour.

Design the slab and show the reinforcement on a sketch of the cross section. [25 marks]

END OF EXAMINATION