



UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER I
SESSION 2023/2024**

- COURSE NAME : ADVANCED STRUCTURAL DESIGN
- COURSE CODE : BFS 40903
- PROGRAMME CODE : BFF
- EXAMINATION DATE : JANUARY / FEBRUARY 2024
- DURATION : 3 HOURS
- INSTRUCTIONS :
1. ANSWER ALL QUESTIONS
 2. THIS FINAL EXAMINATION IS CONDUCTED VIA
 - Open book
 - Closed book
 3. DESIGN SHOULD BE BASED ON:
BS EN1990:2002+A1:2005,
BS EN1991-1-1:2002,
BS EN1992-1-1:2004,
BS EN1993-1-1:2005

THIS QUESTION PAPER CONSISTS OF **FOUR (4)** PAGES

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Q1 Figure Q1.1 shows a plan view of a four-storey building. In order to provide vertical support to adjacent slabs and acting as braced building, shear walls are designed along the gridline. The shear walls are supported on the pile foundations. The height of stump and floor are 1000 mm and 3000 mm, respectively.

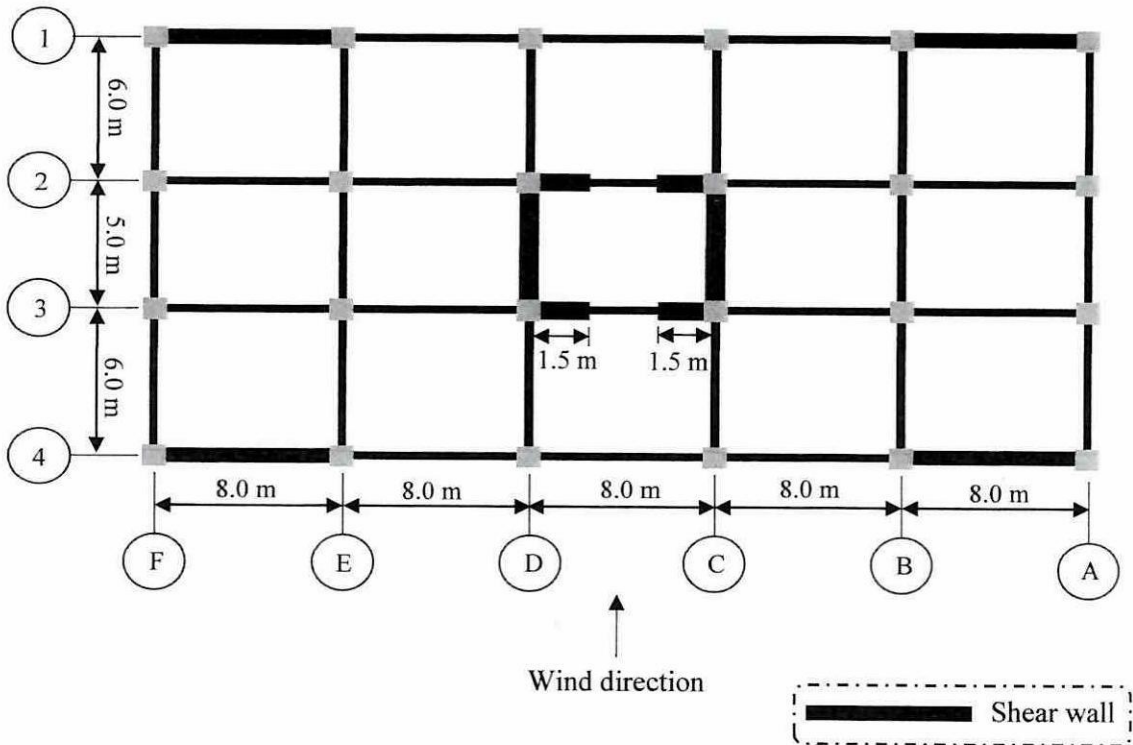


Figure Q1.1 Plan view of a four-storey building

- (a) List and explain **FOUR (4)** types of walls. (8 marks)
- (b) Determine the design ultimate vertical and horizontal actions of shear wall. Given the following specifications:
- | | |
|-------------------------------------|--------------------------|
| Finishes, ceiling and services | = 1.50 kN/m ² |
| Variable action (floor) | = 3.5 kN/m ² |
| Variable action (roof) | = 1.0 kN/m ² |
| Wind pressure | = 1.20 kN/m ² |
| Characteristic strength of concrete | = 30 MPa |
| Characteristic strength of steel | = 500 MPa |
| Nominal cover | = 30 mm |
| Slab thickness | = 150 mm |
| Wall thickness | = 200 mm |
- (15 marks)
- (c) For shear wall in **Q1(b)**, analyse the transverse moments and slenderness of the shear wall.

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(17 marks)

- Q2** A column nib with unchamfered edge was designed to support a precast beam. The nib is designed with thickness of 300 mm, 200 mm wide and 150 mm width. The required link for column is H12 – 250. Given the following specifications:

Ultimate action = 150 kN

Characteristic strength of concrete = 30 MPa

Characteristic strength of steel = 500 MPa

Nominal cover = 40 mm

Size of beam = 300 x 500 mm

Size of column = 500 x 500 mm

Bar diameter = 12 mm

- (a) Sketch a typical bars arrangement of nib.

(5 marks)

- (b) Design the main tensile reinforcement and additional link.

(17 marks)

- (c) Check the design shear resistance of the nib.

(8 marks)

- Q3** **Figure Q3.1** shows a section view of a multi-storey building that imposed by vertical and horizontal loads. The diagonal steel bracers with size CHS 219.1x10 are provided to improve its stability. Given:

Area of CHS section = 65.7 cm²

Second moment of area of CHS section = 3600 cm⁴

Radius of gyration of CHS section = 7.40 cm

Thickness of CHS section = 10.0 mm

Ratio for local buckling of CHS section = 21.9

Yield strength of steel = 355 MPa

Horizontal design force due to equivalent horizontal loads = 45.5 kN

- (a) Describe the precautions that needs to take into account for a sturdy performance of steel bracing.

(10 marks)

- (b) Evaluate the member forces at ground level.

(7 marks)

- (c) Verify the cross-sectional resistance to axial compression and flexural buckling.

(13 marks)

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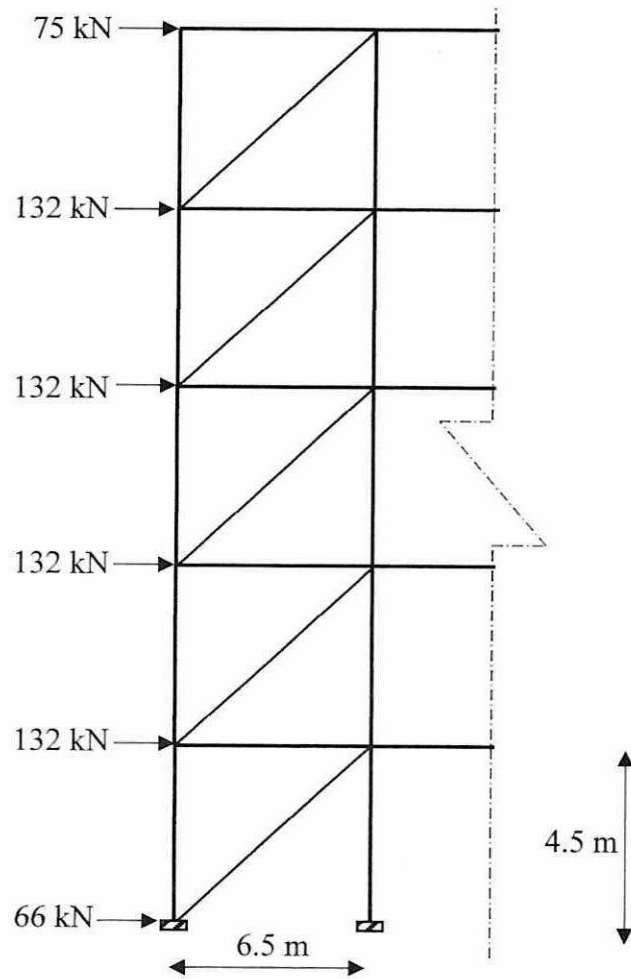


Figure Q3.1 A section view of a multi-storey building

- END OF QUESTIONS -

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