



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2023/2024

- COURSE NAME : ADVANCED STRUCTURAL DESIGN
- COURSE CODE : BFS 40903
- PROGRAMME CODE : BFF
- EXAMINATION DATE : JULY 2024
- DURATION : 3 HOURS
- INSTRUCTIONS :
1. ANSWER ALL QUESTIONS
 2. THIS FINAL EXAMINATION IS CONDUCTED VIA
 - Open book
 - Closed book
 3. STUDENTS ARE **PROHIBITED** TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA CLOSED BOOK

THIS QUESTION PAPER CONSISTS OF FIVE (5) PAGES

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 1/D-F and 4/D-F. The shear walls are supported on the pile foundations. The height of stump and floor are 1500 mm and 3500 mm, respectively. Given the following specifications:

Variable action for floor	= 4.80 kN/m ²
Variable action for roof	= 0.80 kN/m ²
Permanent action for floor	= 5.65 kN/m ²
Permanent action for roof	= 5.88 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

- (a) Determine the design ultimate vertical and horizontal actions of shear wall. (6 marks)
- (b) Analyse the transverse moments and slenderness of shear wall. (11 marks)
- (c) Design the vertical and horizontal reinforcements. (8 marks)

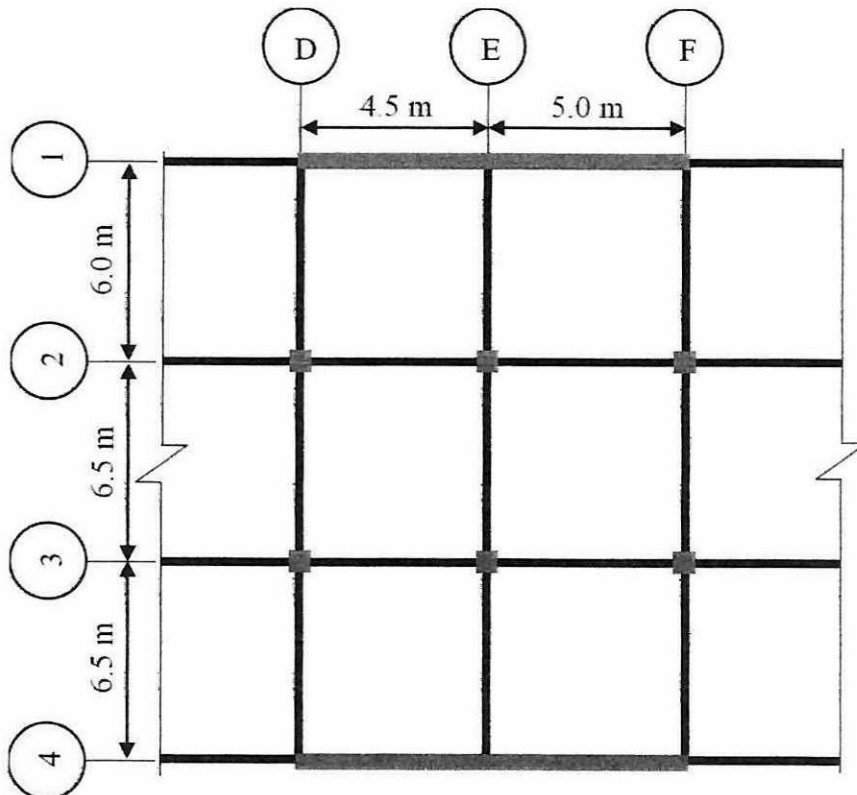


Figure Q1.1

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Q2 Figure Q2.1 shows a plan view and its schematic diagram of column nib used to support precast beams. The proposed thickness of column nib is 300 mm and its width is similar to the column. The centre distance between columns is 6000 mm. Given the following specifications:

Variable action	= 4.00 kN/m ²
Permanent action	= 1.35 kN/m ²
Characteristic strength of concrete	= 30 MPa
Characteristic strength of steel	= 500 MPa
Nominal cover	= 40 mm
Size of beam	= 300 x 500
Size of column	= 500 x 500

Referring to column 2/B,

- (a) Analyse the bearing stress of column nip. (6 marks)
- (b) Design the main tensile reinforcement and closed link. (13 marks)
- (c) Draw the detailing of column nib. Use main reinforcement and shear link of column as 4H25 and H10-175, respectively. (6 marks)

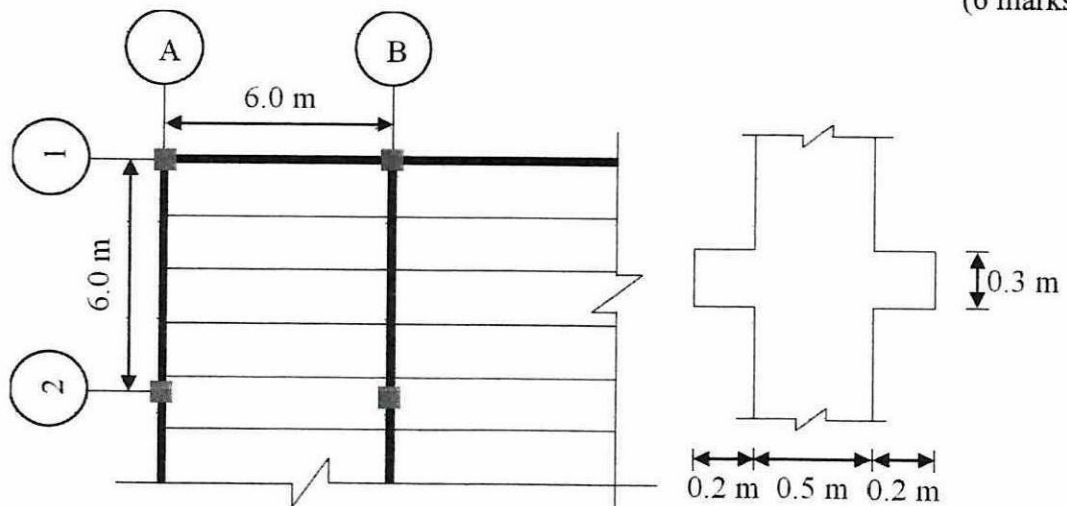


Figure Q2.1

- Q3** (a) Describe **FIVE (5)** advantages of using cold-formed steel frame in residential building construction. (10 marks)

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- (b) **Figure Q3.1** shows a lipped channel section LL15230 subjected to a uniform distributed load. The lipped channel section is an upper element of cold-formed steel frame. Given the following specifications:

Variable action	= 2.50 kN/m
Permanent action	= 0.75 kN/m
Span of joist	= 5000 mm
Spacing between joist	= 500 mm
Yield strength of steel	= 275 MPa

- (i) Evaluate the effective section properties at the Ultimate Limit State. (7 marks)
- (ii) Check the bending resistant of the lipped channel. (8 marks)

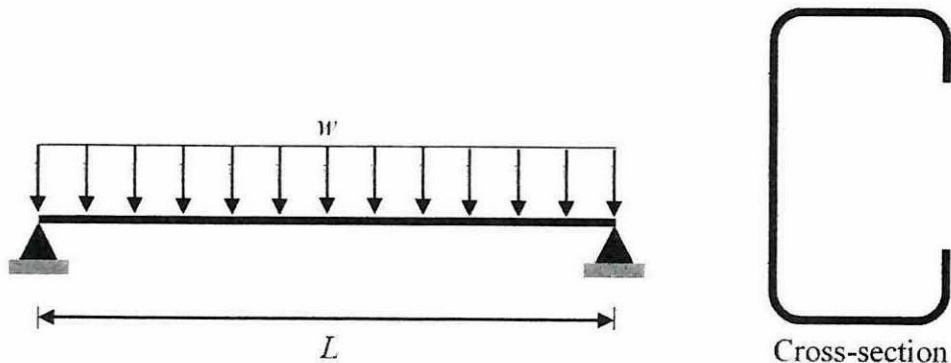


Figure Q3.1

- Q4** (a) If a steel frame is associated with wind load, discuss **THREE (3)** necessary considerations to conform the standard design practise. (6 marks)
- (b) **Figure Q4.1** 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 the following specifications:

Variable action for floor	= 1550 kN
Variable action for roof	= 202 kN
Permanent action for floor	= 2300 kN
Permanent action for roof	= 560 kN
Wind load	= 463 kN
Yield strength of steel	= 355 MPa

- (i) Propose a suitable connection of bracing to beam-column. Use non-preloaded Class 8.8 M24 diameter bolt.

(6 marks)

- (ii) Check the single shear of bolt.

(13 marks)

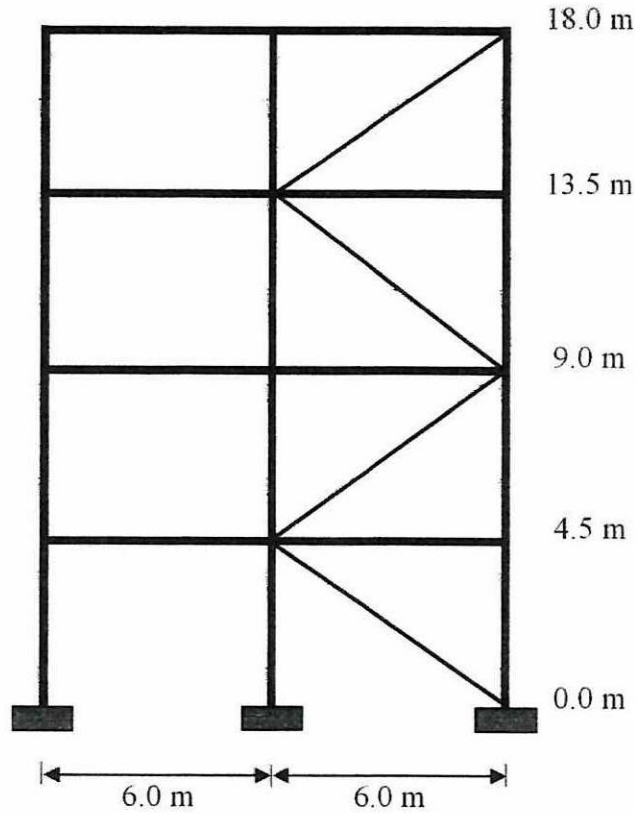


Figure Q4.1

– END OF QUESTIONS –

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