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# UTHM

Universiti Tun Hussein Onn Malaysia

**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
SEMESTER II  
SESSION 2021/2022**

- COURSE NAME : STRUCTURAL DESIGN
- COURSE CODE : BFC 34702
- PROGRAMME CODE : BFF
- EXAMINATION DATE : JULY 2022
- DURATION : 2 HOURS AND 30 MINUTES
- INSTRUCTION
1. ANSWER ALL QUESTIONS
  2. THIS FINAL EXAMINATION IS AN **ONLINE ASSESSMENT** AND CONDUCTED VIA **OPEN BOOK**.
  3. DESIGN SHOULD BE BASED ON:  
BS EN1990:2002+A1:2005  
BS EN1991-1-1:2002  
BS EN1992-1-1:2004  
BS 8110: 1: 1997

THIS QUESTION PAPER CONSISTS OF **SIX (6) PAGES**

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**Q1** Figure Q1(a) shows the first floor structural layout plan for a factory-office building and Figure Q1(b) shows the detailing of beam 1/A-B. The brickwall of 3.5 m height is construct on the beams perimeter (A0/1-2, B/1-2, 1/A0-B and 2/A0-B). Other design data are as follows:

All slabs thickness	= 150 mm
All beams size	= 250 x 750 mm
Characteristic strength of concrete	= 30 MPa
Characteristic strength of steel reinforcement	= 500 MPa
Unit weight of reinforced concrete	= 25 kN/m <sup>3</sup>
Finishes and services	= 1.5 kN/m <sup>2</sup>
Brickwall	= 2.6 kN/m <sup>2</sup>
Variable action	= 3.0 kN/m <sup>2</sup>

- (a) Illustrate the load cases to be considered in designing beam 1/A-B. (5 marks)
- (b) Identify and analyse one of the load case in Q1(a) that will cause maximum sagging moment at span 1/A-B. (20 marks)
- (c) Based on the analysis in Q1(b) and Figure Q1(b), check if the shear link near support B is adequate. (10 marks)
- Q2** Figure Q2 shows a part of floor system consist of beams and suspended slabs. The beam sizes 250 mm x 500 mm are continuously spanning 6 m between columns. The characteristic material strengths are  $f_{ck} = 30 \text{ N/mm}^2$  and  $f_{yk} = 500 \text{ N/mm}^2$ .
- (a) Determine the effective flange width of beam A/1-2 and B/1-2. (14 marks)
- (b) Based on the analysis in Q2(a), design the main reinforcement for the beam A/1-2 if the bending moment, M is 800 kNm, effective depth is 430 mm and the depth to compression reinforcement is 50 mm. (14 marks)
- (c) Verify deflection of the beam A/1-2 according to EC2. (7 marks)

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- Q3** (a) A timber floor joist is subjected to a uniformly distributed load. The joists are spaced 450 mm centres with effective span of 3.0 metres. Based on bending stress, suggest a suitable size of select grade Penaga at 18% moisture content, in accordance with MS 544: Part 2: 2001. Given,

Variable action = 0.25 kN/m

Permanent action = 1.\*\* kN/m

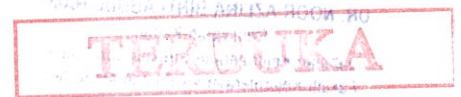
(\*\* is the last two digits of your matric card number. For example, your matric card number is AF200102. Therefore \*\* is 02 and dead load is 1.02 kN/m).

(15 marks)

- (b) For the timber joists as in **Q3(a)** above, conduct all necessary checking. Use bearing width = 50 mm.

(15 marks)

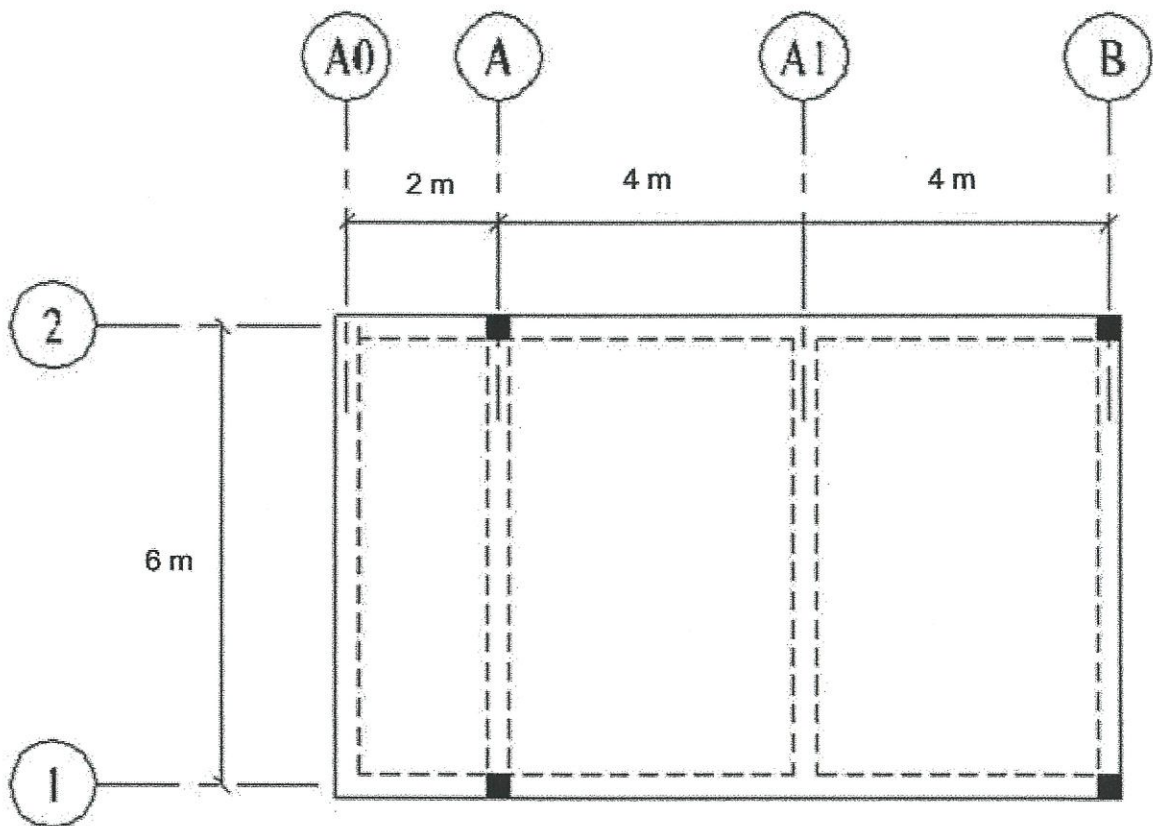
**– END OF QUESTIONS –**



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Notes:

1. All First Floor Beams To Be 250 mm x 750 mm
2. All First Floor Slabs To Be 150 mm Thick

**FIGURE Q1(a)**

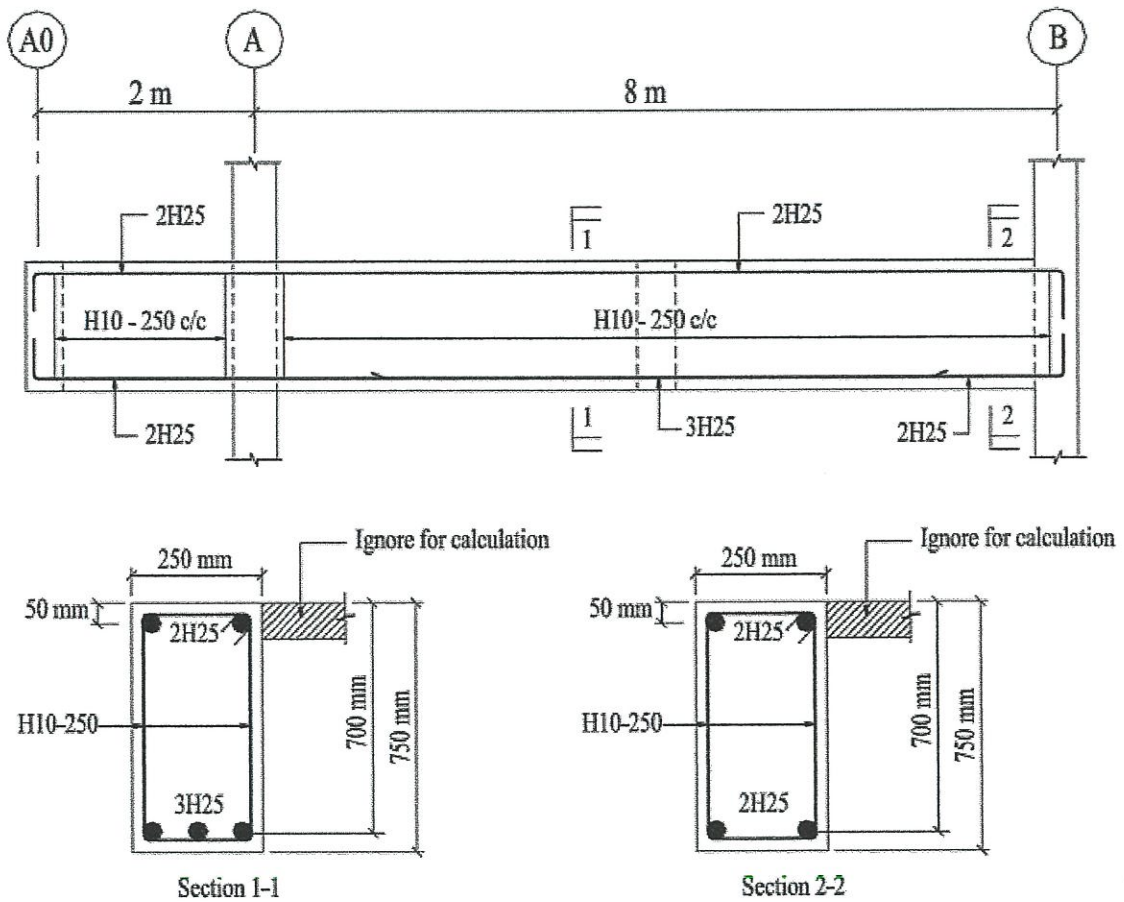
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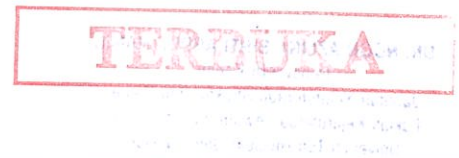
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Detailing of Beam 1/A-B

FIGURE Q1(b)



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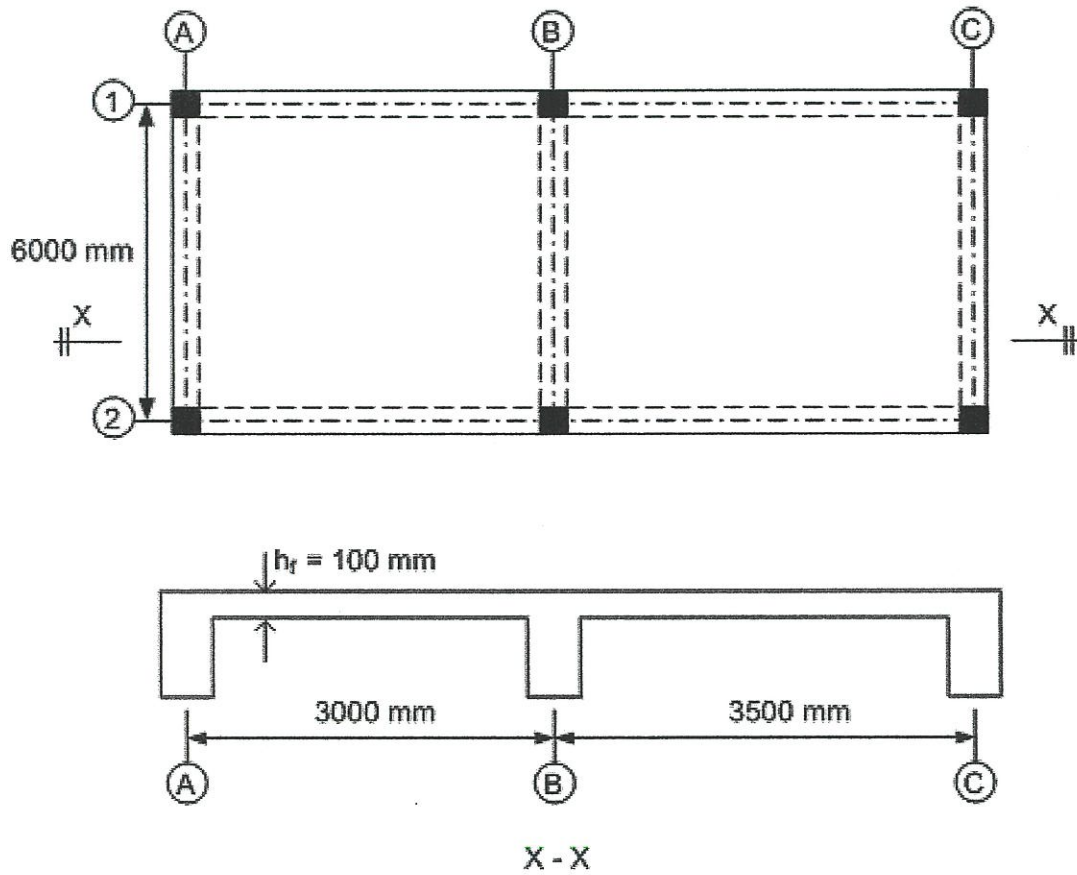


FIGURE Q2

