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UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
(ONLINE)
SEMESTER II
SESSION 2020/2021**

COURSE NAME : ADVANCED STRUCTURE
ANALYSIS

COURSE CODE : MFA10203

PROGRAMME CODE : MFA

EXAMINATION DATE : JULY 2021

DURATION : 3 HOURS

INSTRUCTION : ANSWER ALL QUESTIONS
CLOSE BOOK EXAMINATION

THIS QUESTION PAPER CONSISTS OF **FIVE (5)** PAGES

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Q1 For the column shown in **Figure Q1**, Support B provides lateral support in the plane of the figure while Support A and C provide lateral support perpendicular to the plane of the figure.

a) States the possibilities of buckling of the column and provide explanations (5 marks)

b) Determine the allowable load P_{allow} given the Factor of Safety, $n = 2$ (20 marks)

Q2 (a) List and draw **THREE (3)** common types of element used in finite element method. (6 marks)

(b) For the two member truss shown in **Figure Q2(b)**, determine the reaction forces at node 1 and node 3. Given displacement at Joint 2 is:

$$\begin{Bmatrix} d_1 \\ d_2 \end{Bmatrix} = \begin{Bmatrix} 4.505/AE \\ -19.003/AE \end{Bmatrix}$$

(19 marks)

Q3 (a) Explain briefly **THREE (3)** conditions which must be satisfied to ensure full collapse of a structure. (6 marks)

(b) **Figure Q3(b)** shows a 2-bay frame with pin supports at A and E, and roller supports at G. The frame is loaded with 115kN and 74 kN vertical loads at point C and F, respectively. Determine the critical moment, M_p . (19 marks)

Q4 (a) Define isotropic and orthotropic slabs in term of reinforcement provided in the slab. (4 marks)

(b) Draw the Yield Line pattern for slabs with cross sections in **Figure Q4(b)**. (8 marks)

(c) **Figure Q4(c)** shows an isotropic triangular slab subjected to a point load, P. The slab is simply supported at all its edges. Determine the ultimate resistance moment of the slab, m in term of P. (13 marks)

END OF QUESTIONS

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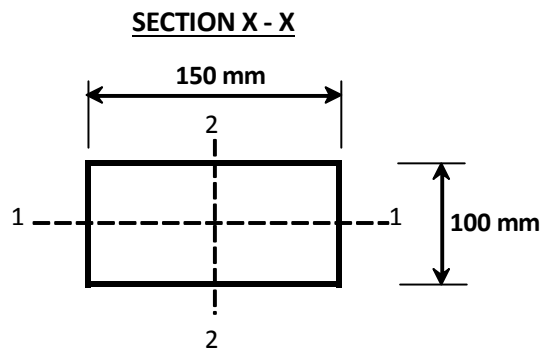
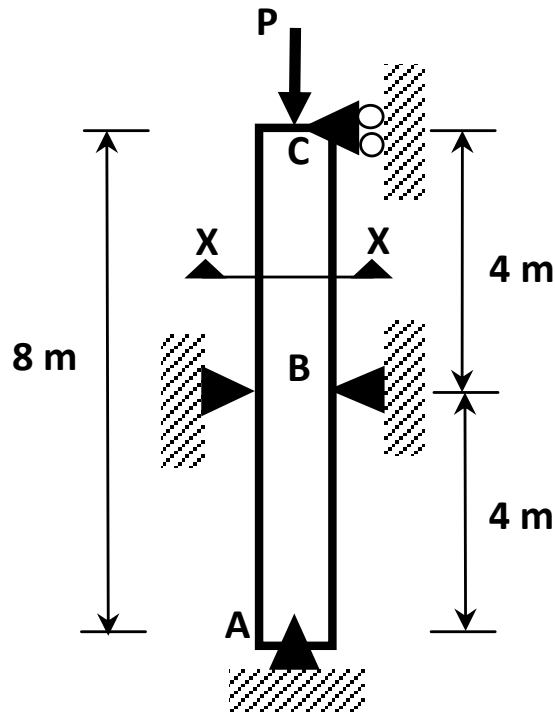


Figure Q1: Lateral support

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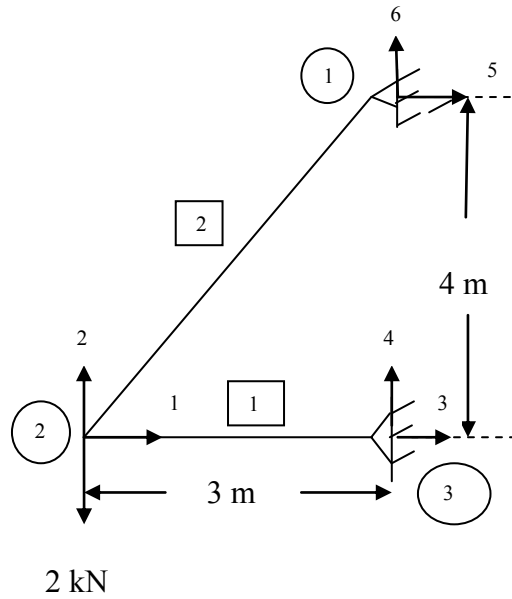


Figure Q2(b): Member truss

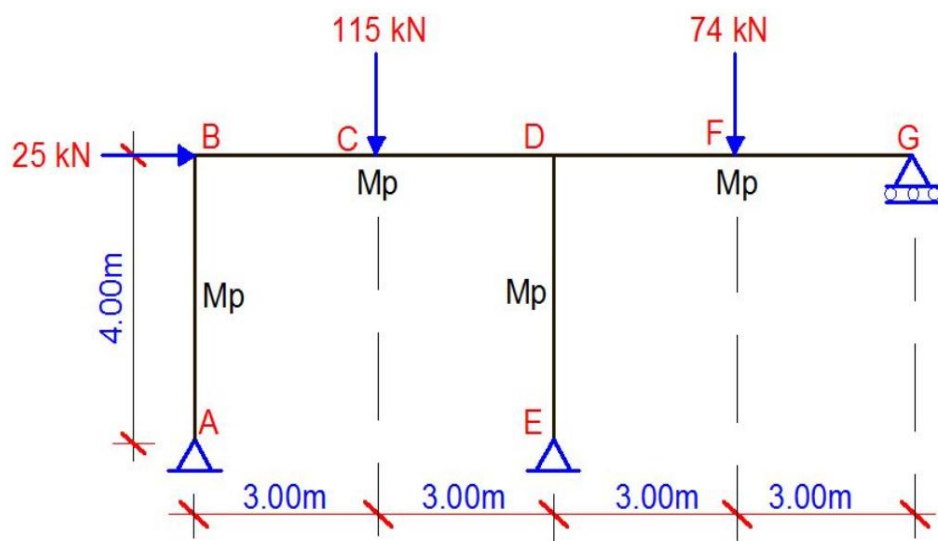


Figure Q3(b): 2-bay frame

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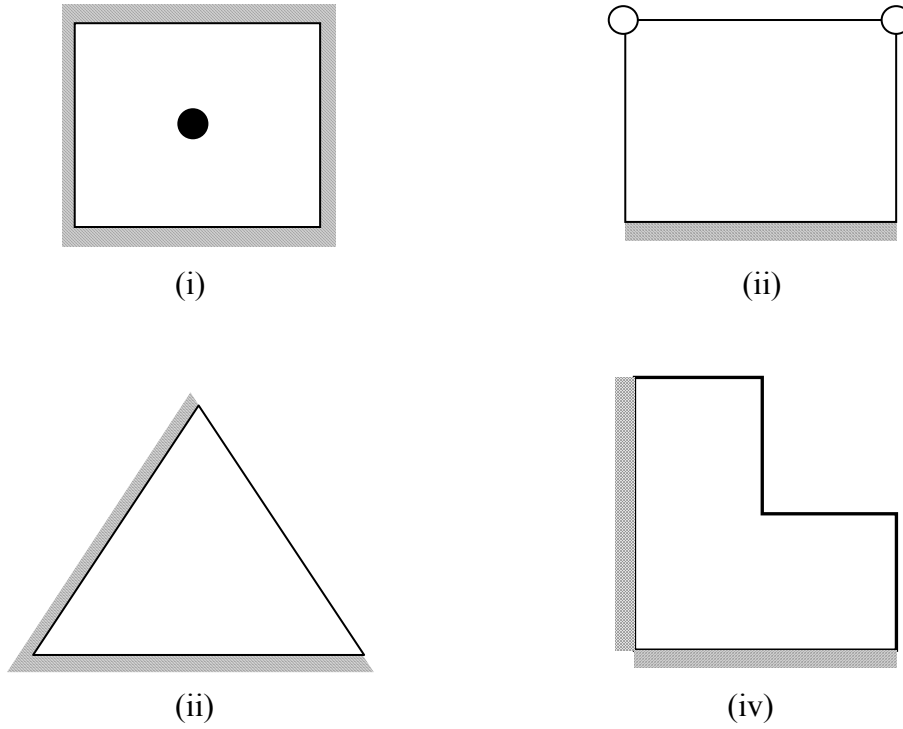


Figure Q4(b): Slabs

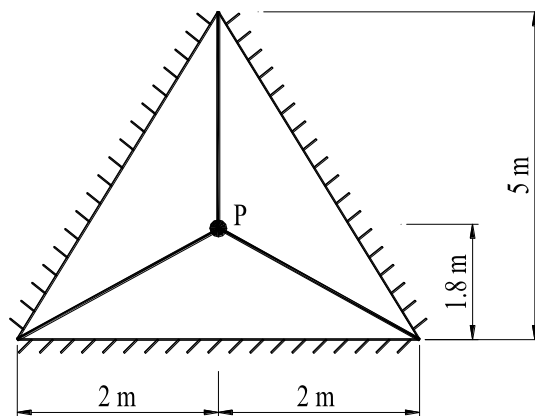


Figure Q4(c): Isotropic triangular slab

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