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**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
SEMESTER II  
SESSION 2022/2023**

COURSE NAME : STRUCTURAL ANALYSIS

COURSE CODE : BFC21403

PROGRAMME CODE : BFF

EXAMINATION DATE : JULY / AUGUST 2023

DURATION : 3 HOURS

INSTRUCTIONS

1. ANSWER ALL QUESTIONS
2. THIS FINAL EXAMINATION IS CONDUCTED VIA **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 **SIX (6)** PAGES

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- Q1** **Figure Q1** shows a truss that is pinned supported at A and roller supported at B and C. The truss is subjected to uniform load of 30 kN/m between D and E. The cross-section area for the truss member is 400 mm<sup>2</sup> and the Young's Modulus for all truss members is 200 kN/mm<sup>2</sup>.
- (a) Classify the truss as statically determinate or statically indeterminate. If the truss is statically indeterminate, highlight whether it is internally or externally indeterminate. (1 marks)
  - (b) Determine the virtual force for all internal member when support B is taken as redundant (redundant force acting upward). (10 marks)
  - (c) Based on **Q1(b)** calculate the internal forces of the truss member using alternative method. (14 marks)
- Q2** **Figure Q2** shows a continuous beam, cantilevered at AB and fixed at E. The beam is subjected to uniformly distributed load of 50 kN/m and point load of 75kN on span BC, respectively. The length of the span is shown in the figure and EI is constant.
- (a) Calculate the stiffness, distribution factor (DF) and fixed end moment for each span of the beam. (16 marks)
  - (b) Determine the internal moments at each support of the beam. (9 marks)
- Q3**
- (a) State briefly the difference between moment from influence line and moment from bending moment diagram. (4 marks)
  - (b) As shown in the **Figure Q3**, a beam crossed by the train of four loads. Determine the maximum moment at mid-span using influence line method. (21 marks)

- Q4** (a) Describe the process of developing a plastic hinge and moment plastic in a statically indeterminate beam, using a diagram. (8 marks)
- (b) **Figure Q4** shows a frame fixed at both columns and loaded with point load  $2P$  at C and point load  $P$  at B. Given  $L=20$  m,  $M_{p1}=30$  kNm,  $M_{p2}=55$  kNm,  $M_{p3}=20$  kNm.
- i) Draw all the possible mechanism (6 marks)
- ii) Calculate the value of  $P$  in each mechanism (9 marks)
- iii) Find the maximum  $P$  (2 marks)

– END OF QUESTIONS –

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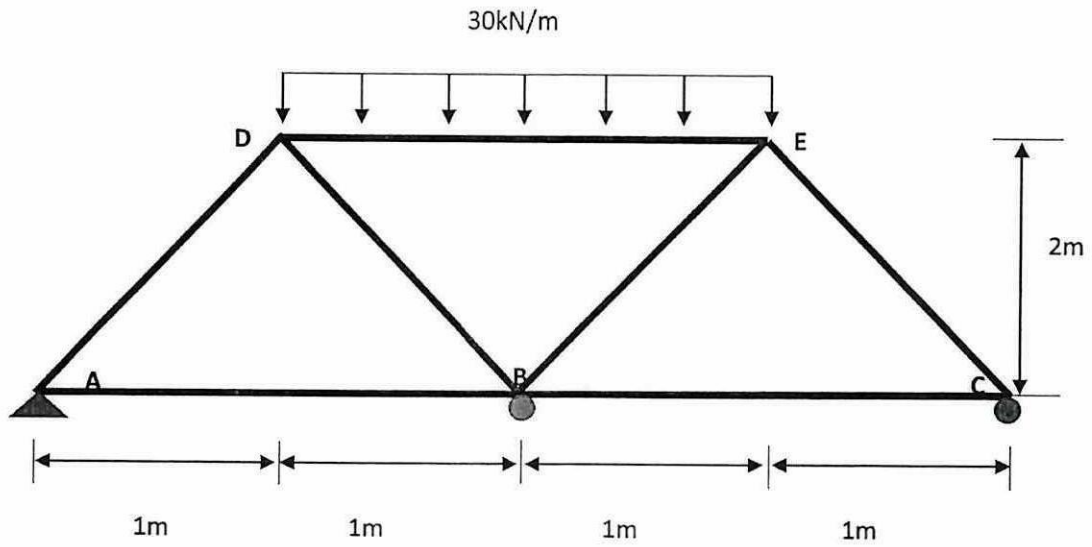


Figure Q1

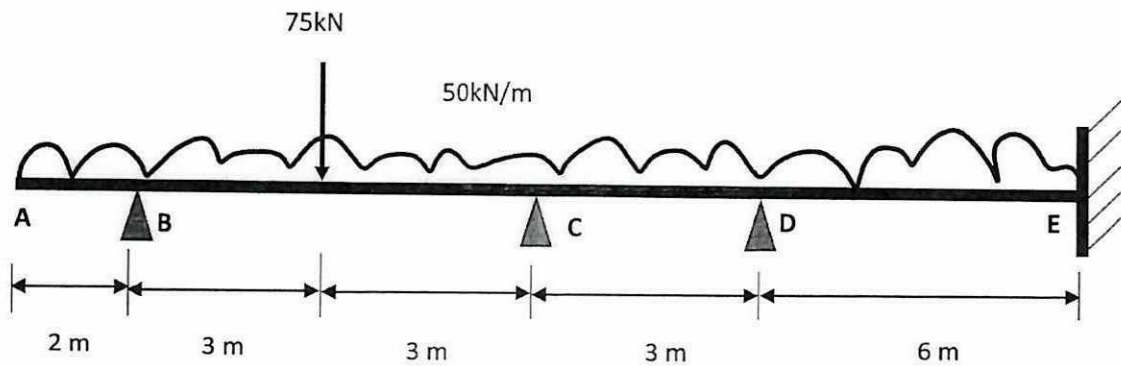


Figure Q2

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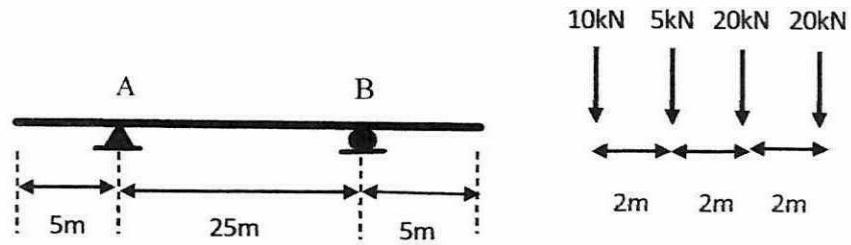


Figure Q3

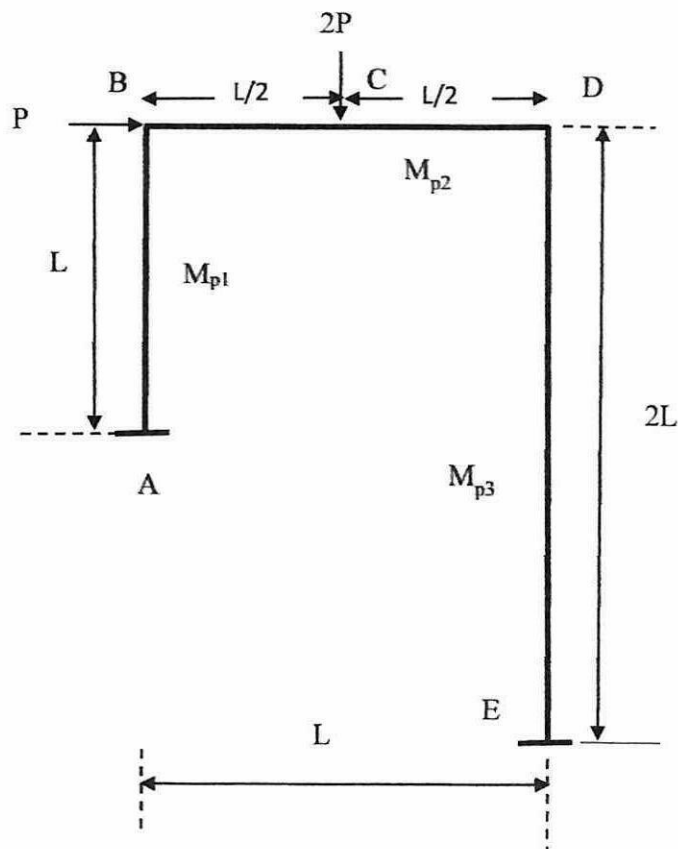


Figure Q4

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**Fixed End Moment**

