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Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER II
SESSION 2018/2019**

COURSE NAME : STRUCTURAL ANALYSIS
COURSE CODE : BFC21403
PROGRAMME CODE : BFF
EXAMINATION DATE : JUNE / JULY 2019
DURATION : 3 HOURS
INSTRUCTION : ANSWER ALL QUESTIONS IN
SECTION A AND ONE (1)
QUESTION IN SECTION B

THIS QUESTION PAPER CONSISTS OF **EIGHT (8)** PAGES

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SECTION A

- Q1** (a) Explain the principle of virtual work method in truss application (5 marks)
- (b) Statically indeterminate trusses can be classified into **TWO (2)** types; external indeterminate and internal indeterminate. Briefly explain the differences between these types of trusses with the help of sketch (if necessary). (5 marks)
- (c) **Figure Q1(c)** shows a plane truss that is roller supported at A and pinned supported at F. The truss is subjected to vertical and horizontal loads of 60 kN and 30 kN at C, respectively. The cross section area for the truss member is 1000 mm² and the Young's Modulus for all truss members is 250 kN/mm².
- (i) Prove that the truss is statically internal indeterminate. (2 marks)
- (ii) Determine the reaction at supports A and F. (3 marks)
- (iii) Determine the internal forces of the truss member using alternative method. Assume member BF as redundant. (20 marks)
- (iv) Sketch the truss with real internal forces in all members. (5 marks)
- Q2** **Figure Q2** shows the frame which is subjected to uniformly distributed load of 12 kN/m along BC. Three point loads of 40 kN, 40 kN and 25 kN are acting on mid span of AB and CF and point G, respectively. Supports D and E are fixed and supports A and F are pinned. EI value is constant.
- (a) Determine the Fixed End Moment (FEM) for all members (5 marks)
- (b) Determine the distribution factors for all members (5 marks)
- (c) Analyse the final moments at all joints using modified stiffness of moment distribution method (10 marks)
- (d) Determine the reaction for all supports (5 marks)

- (e) Draw the shear force and bending moment diagram for the frames (5 marks)

SECTION B

- Q3** (a) Explain briefly, how the influence lines could play an important part in the designs of the heavy structures such as bridges, industrial crane rails, conveyor and other structures with moving loads across their span. (5 marks)
- (b) **Figure Q3(b)** shows a Pratt truss with pin and roller supported at point A and E, respectively. The span of each horizontal member is 3 m and the height of vertical member is 4 m.
- (i) Determine the influence line for reaction point A. (5 marks)
- (ii) Analyse and draw the influence line for members IC, IJ, and ID. (20 marks)
- Q4** (a) Describe briefly **TWO (2)** advantages of plastic analysis. (9 marks)
- (b) **Figure Q4(b)** shows a two-bay frame fixed at its ends. Each beam and column has equal plastic moment of M_p . A horizontal point load of 40 kN acting on point B while vertical 40 kN and 60 kN each acting on mid-span of beams BC and CE. Determine the maximum plastic moment for the frame system. (21 marks)

– END OF QUESTIONS –

FINAL EXAMINATION

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PROGRAMME CODE : 2 BFF
COURSE CODE : BFC21403

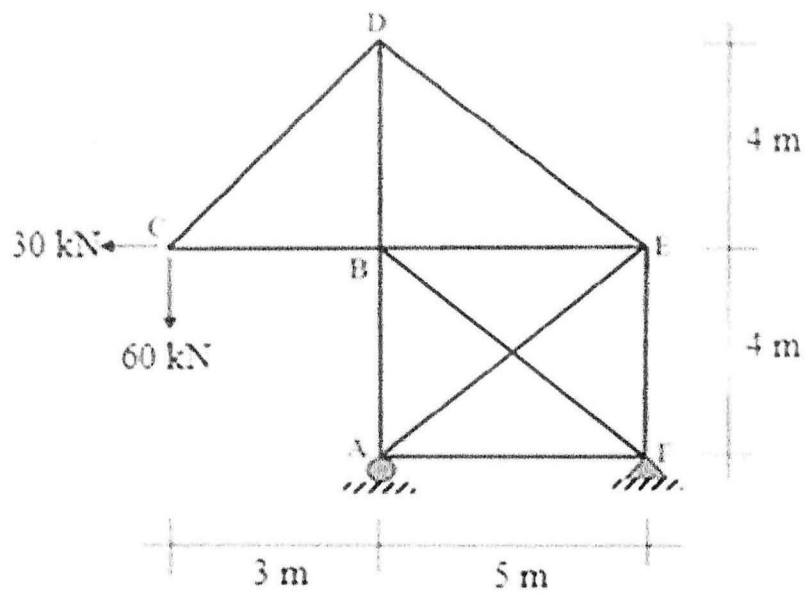


FIGURE Q1(c)

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SEMESTER/SESSION : SEM II / 2018/2019
COURSE NAME : STRUCTURAL ANALYSIS

PROGRAMME CODE : 2 BFF
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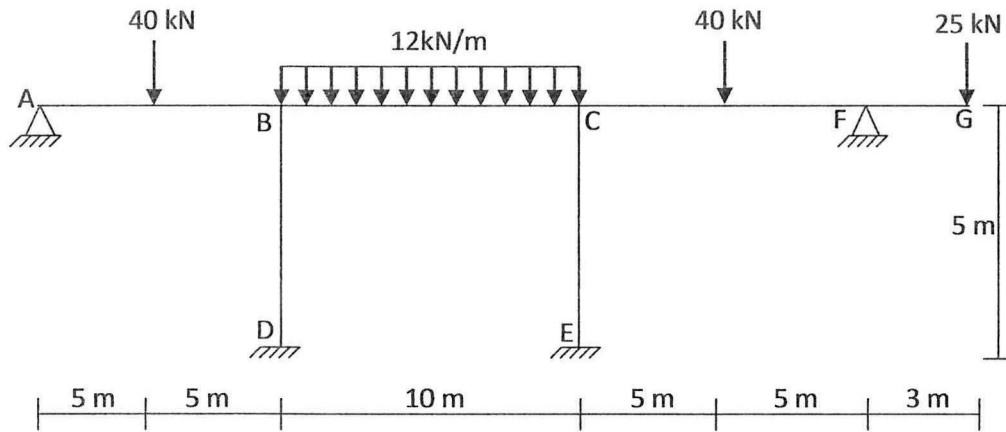


FIGURE Q2

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SEMESTER/SESSION : SEM II / 2018/2019
COURSE NAME : STRUCTURAL ANALYSIS

PROGRAMME CODE : 2 BFF
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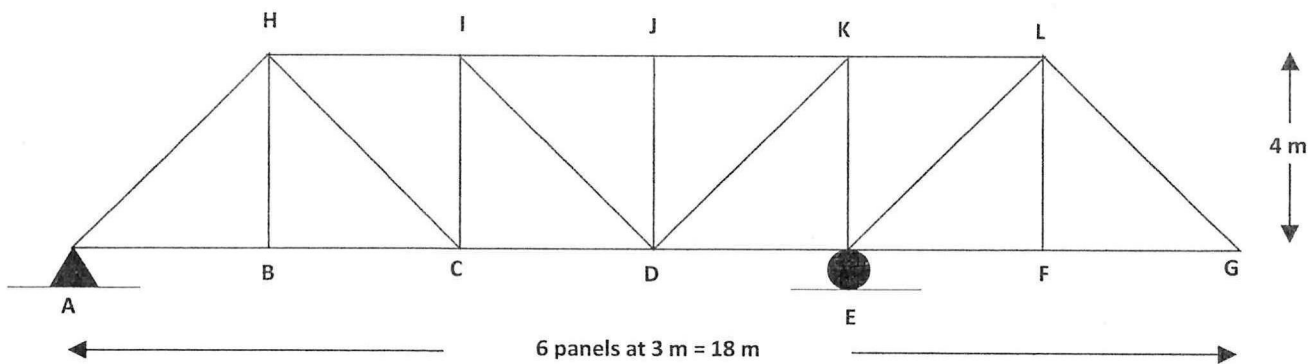


FIGURE Q3 (b)

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SEMESTER/SESSION : SEM II / 2018/2019
COURSE NAME : STRUCTURAL ANALYSIS

KOD PROGRAM : 2 BFF
COURSE CODE : BFC21403

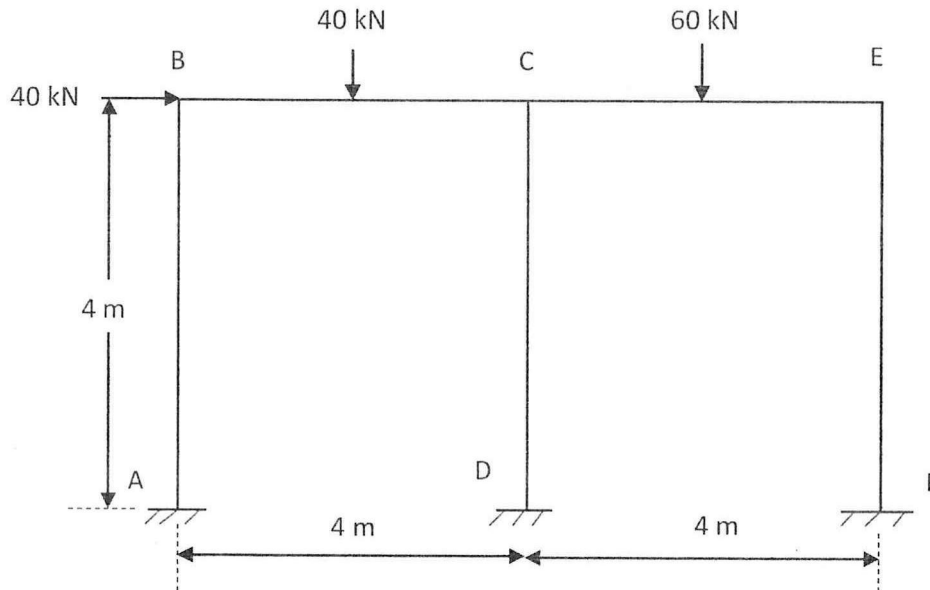


FIGURE Q4 (b)

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FIXED END MOMENTS:

