UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
(ONLINE)
SEMESTER II
SESSION 2020/2021

COURSE NAME	:	STRUCTURAL ANALYSIS
COURSE CODE	:	BFC21403
PROGRAMME CODE	:	BFF
EXAMINATION DATE	:	JULY 2021
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

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

Q1 (a) List **TWO (2)** static equilibriums used to analyze statically determinate truss by using joint method.

(2 marks)

(b) **Figure Q1(b)** shows a simply supported roof truss of a residential house. The crane is supported by pin support and roller support at points E and A respectively. The cross-section area for the truss member is 750 mm^2 and the Young's Modulus for all truss members is 250 kN/mm^2.

(i) Calculate the reaction supports of the truss.

(4 marks)

(ii) Determine the internal forces of the truss members.

(9 marks)

(iii) Architect of the project presented a new change of truss support by addition roller support at point C. Therefore, the redundant vertical upward force is applied at support C. As a structural engineer, how do you interpret the new internal force of this structure.

(10 marks)

Q2 (a) Define stiffness in moment distribution method.

(2 marks)

(b) **Figure Q2(b)** shows a warehouse non-sway frame fixed supported at A and E while pinned support at F. The frame is uniformly loaded throughout span BC with 10 kN/m load. All frame members were made of mild steel.

(i) Calculate the end moments for all members.

(12 marks)

(ii) Determine all the reactions at supports.

(4 marks)

(iii) Draw the shear force diagrams.

(4 marks)

(c) Predict the end moment of member DE if support at E is pinned support.

(3 marks)

Q3 (a) Describe the theorems that are very useful in the application of influence lines.

(5 marks)

(b) **Figure Q3(b)** shows a Pratt truss with pin support and roller support at point A and G, respectively. The span of each horizontal member is 3 m and the height of vertical member is also 3 m.

(i) Find the influence line for RA.

(5 marks)

(ii) Draw the influence diagram for members JK, DK and DE.

(15 marks)

Q4 (a) Describe the terminology of plastic hinge.

(5 marks)

(b) **Figure Q4(b)** shows a two span continuous beam with point load, P, at a distance L/2 from point A and distributed load, q, acting along span BC.

(i) Sketch the possible collapse mechanisms for the frame.

(5 marks)

(ii) Determine the maximum collapse load.

(15 marks)

- END OF QUESTIONS –

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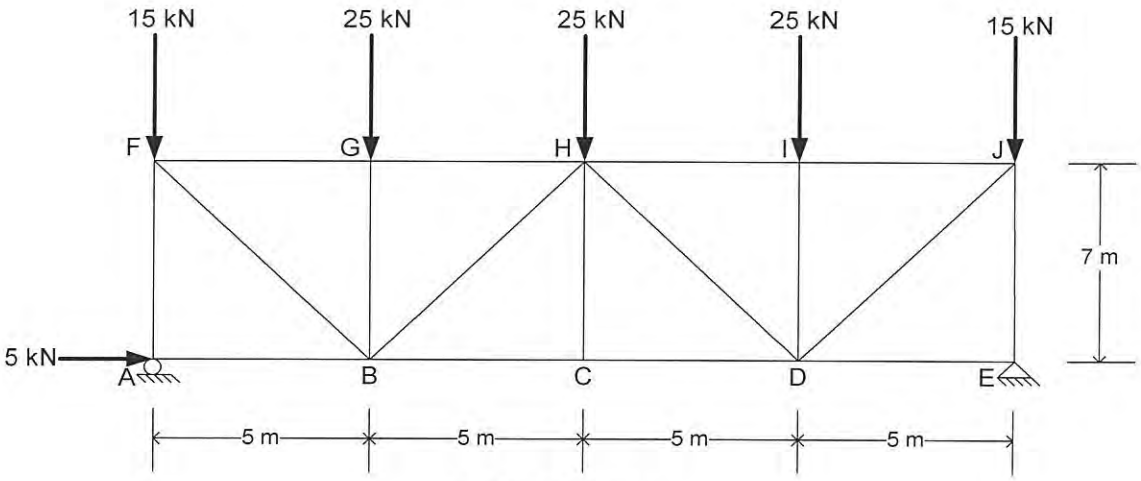

FIGURE Q1(b)

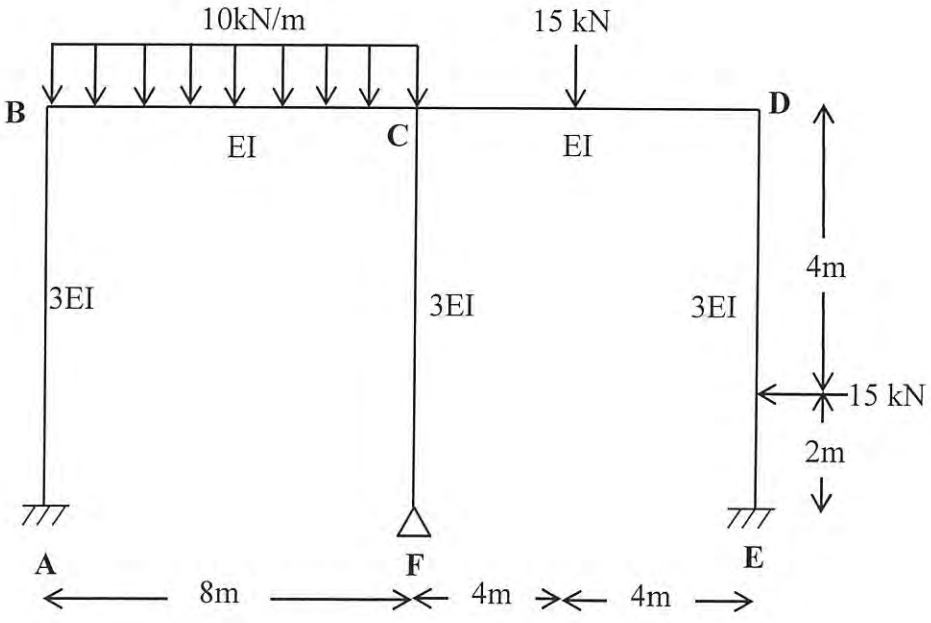

FIGURE Q2(b)

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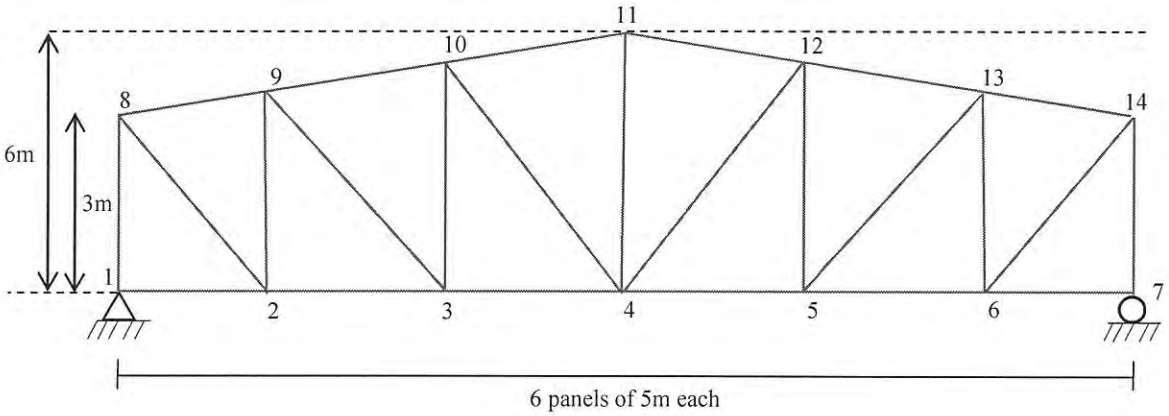

FIGURE Q3(b)

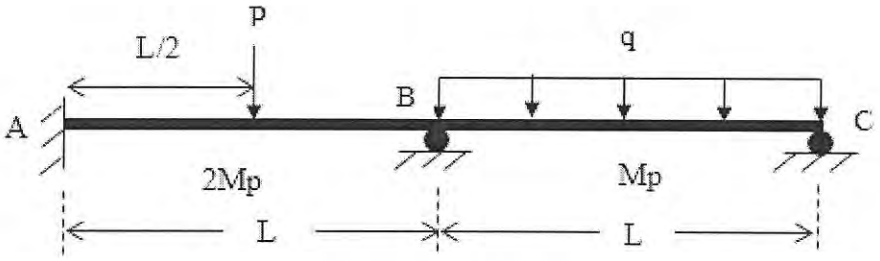

FIGURE Q4(b)

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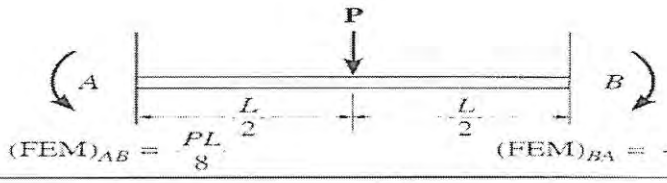
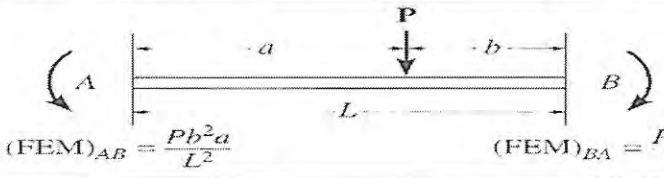
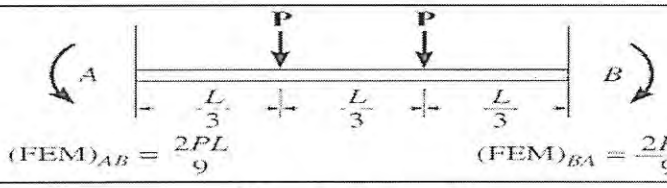
FIXED END MOMENTS:



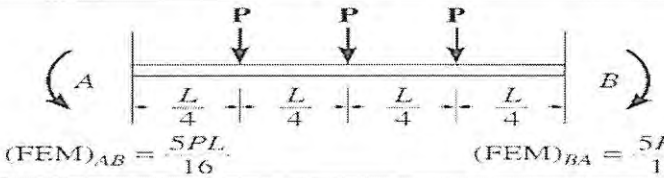
$(FEM)_{AB} = \frac{PL}{8}$ $(FEM)_{BA} = \frac{PL}{8}$



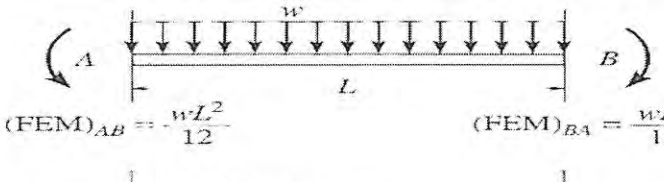
$(FEM)_{AB} = \frac{Pb^2a}{L^2}$ $(FEM)_{BA} = \frac{Pa^2b}{L^2}$



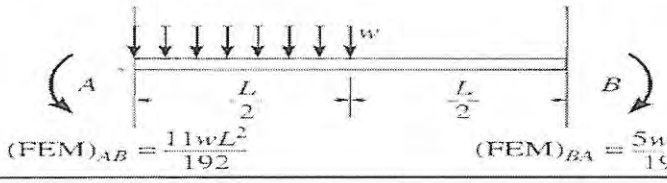
$(FEM)_{AB} = \frac{2PL}{9}$ $(FEM)_{BA} = \frac{2PL}{9}$



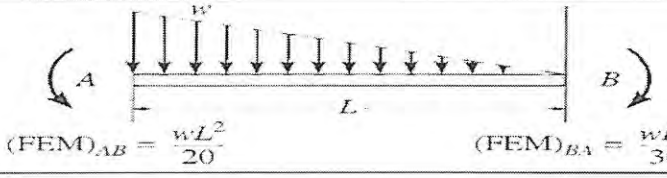
$(FEM)_{AB} = \frac{5PL}{16}$ $(FEM)_{BA} = \frac{5PL}{16}$



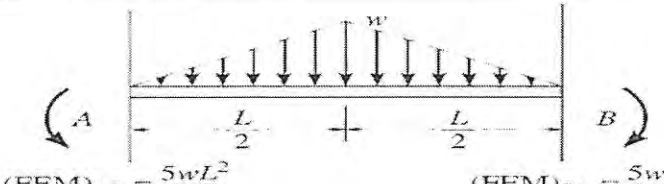
$(FEM)_{AB} = \frac{wL^2}{12}$ $(FEM)_{BA} = \frac{wL^2}{12}$



$(FEM)_{AB} = \frac{11wL^2}{192}$ $(FEM)_{BA} = \frac{5wL^2}{192}$



$(FEM)_{AB} = \frac{wL^2}{20}$ $(FEM)_{BA} = \frac{wL^2}{30}$



$(FEM)_{AB} = \frac{5wL^2}{96}$ $(FEM)_{BA} = \frac{5wL^2}{96}$