Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2017/2018

COURSE NAME	:	STRUCTURAL ANALYSIS
COURSE CODE	:	BFC21403
PROGRAMME CODE	:	BFF
EXAMINATION DATE	:	JUNE/JULY 2018
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS IN **PART A** AND **ONE(1)** QUESTION IN **PART B**

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

PART A

Q1 (a) Truss and frame are categorized as skeleton structure. What is the main difference between truss and frame?

(2 marks)

(b) List **Two (2)** examples of truss structure application.

(2 marks)

(c) **Figure Q1(c)** 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 Modulus for all truss members is 250 kN/mm^2.

(i) Calculate the reaction supports of the truss.

(3 marks)

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

(17 marks)

(iii) Calculate the vertical displacement at joint C. Express your answer in unit millimeter and assume the unit load acting downward.

(9 marks)

(iv) An additional member GC was introduced to the roof truss. Calculate the increment or decrement of internal force for members BC and GH.

(7 marks)

Q2 (a) Define stiffness in moment distribution method.

(3 marks)

(b) **Figure Q2(b)** shows a warehouse non-sway frame fixed supported at A and D while pinned support at E. The frame is uniformly loaded throughout spans AB and BC with 5 kN/m and 15 kN/m loads, respectively. Span BC has addition point loads of 10 kN at mid-span and span CE also have point load of 5 kN at mid-span. All frame members were made from mild steel.

(i) Calculate the end moments for all members.

(14 marks)

(ii) Determine all the reactions at supports.

(5 marks)

(iii) Draw the shear force diagrams.

(8 marks)

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PART B

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

(7 marks)

(b) **Figure Q3(b)** shows a continuous beam which supported by pin at point A and roller at points B and C. A hinge is provided at D.

(i) Draw the influence line for reactions at supports B.

(6 marks)

(ii) Draw the influence line for bending moment at support B for the beam.

(5 marks)

(c) Draw the influence line for the forces in the following members of a through type truss shown in **Figure Q3(c)**.

(i) Member 12-13.

(4 marks)

(ii) Member 5-12.

(4 marks)

(iii) Member 4-12.

(4 marks)

Q4 (a) Describe the terminology of plastic hinge.

(5 marks)

(b) The frame shown in **Figure Q4(b)** is subjected to a concentrated load of 3P and 2P at C and F respectively. The supports are pinned at A and H, and roller at E. All columns have the same plastic moment MP whereas all beams have plastic moment 2Mp.

Given: L= 4 m and P = 5 kN

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

(8 marks)

(ii) Determine the collapse load P.

(17 marks)

- END OF QUESTIONS –

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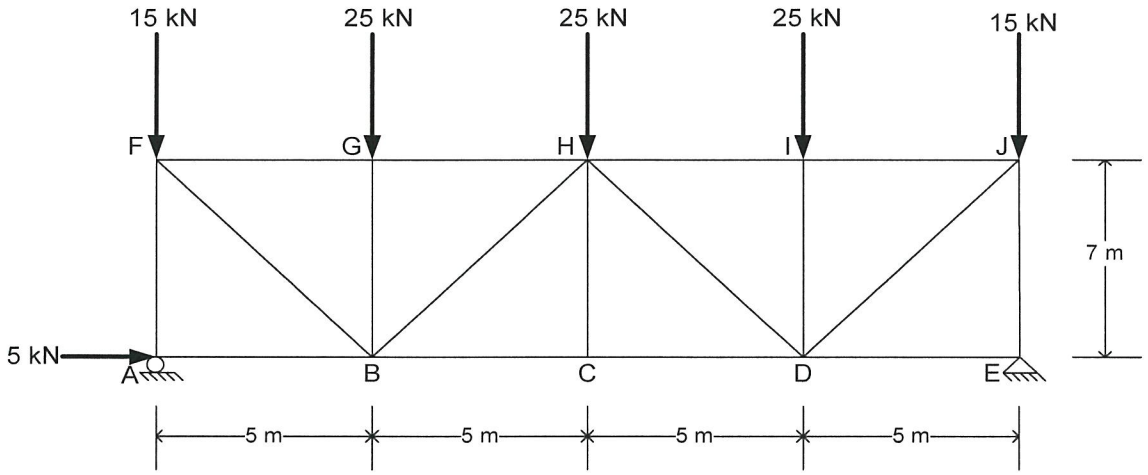

FIGURE Q1(c)

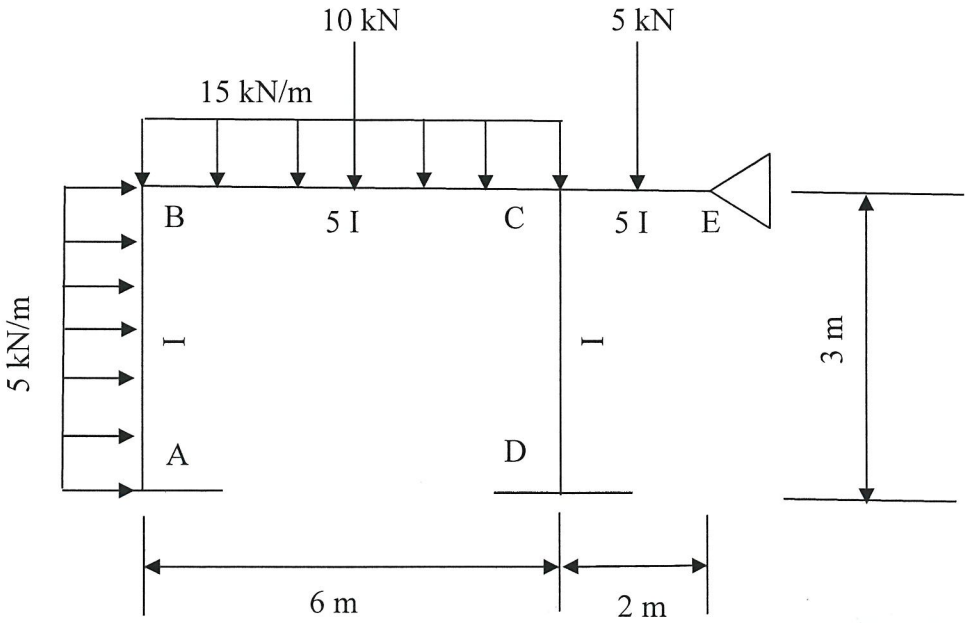

FIGURE Q2(b)

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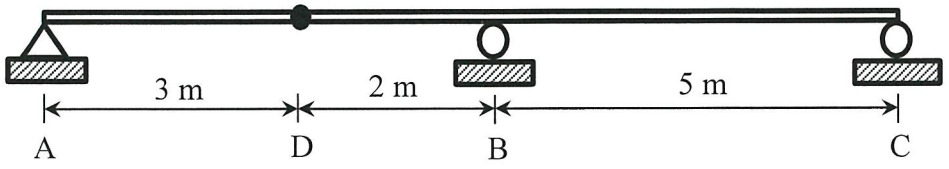

FIGURE Q3(b)

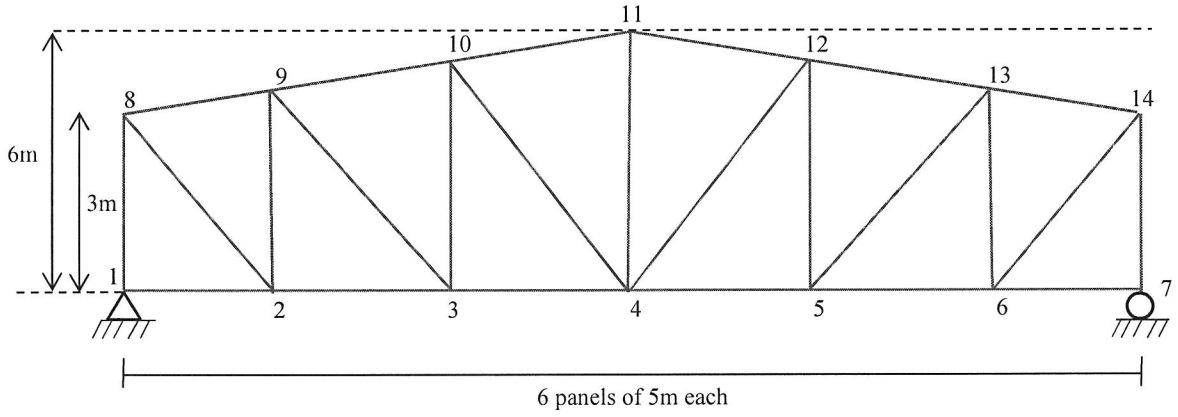

FIGURE Q3(c)

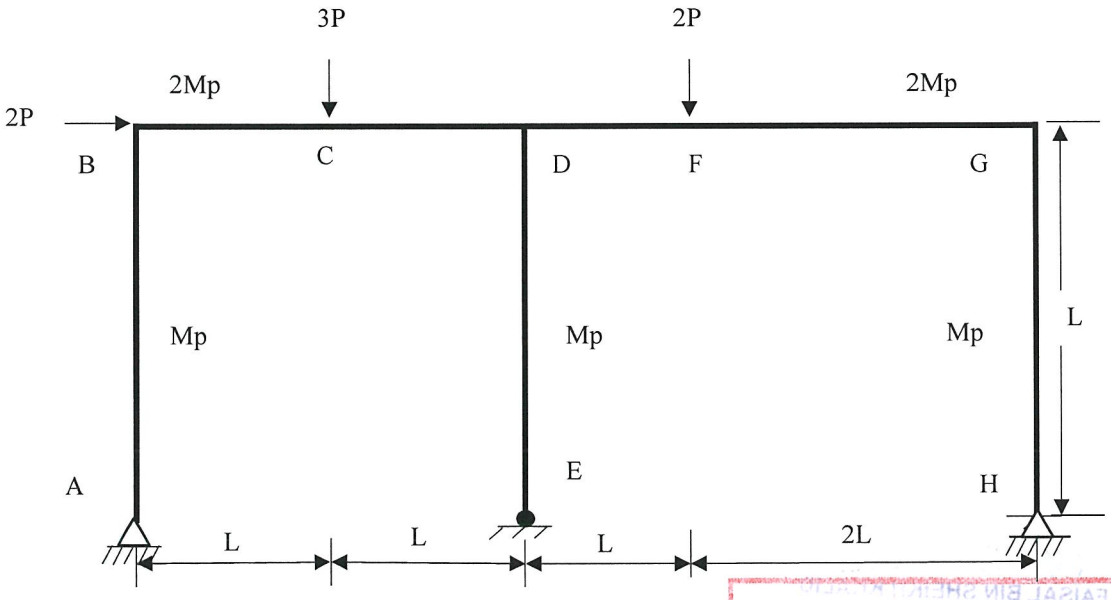

FIGURE Q4(b)

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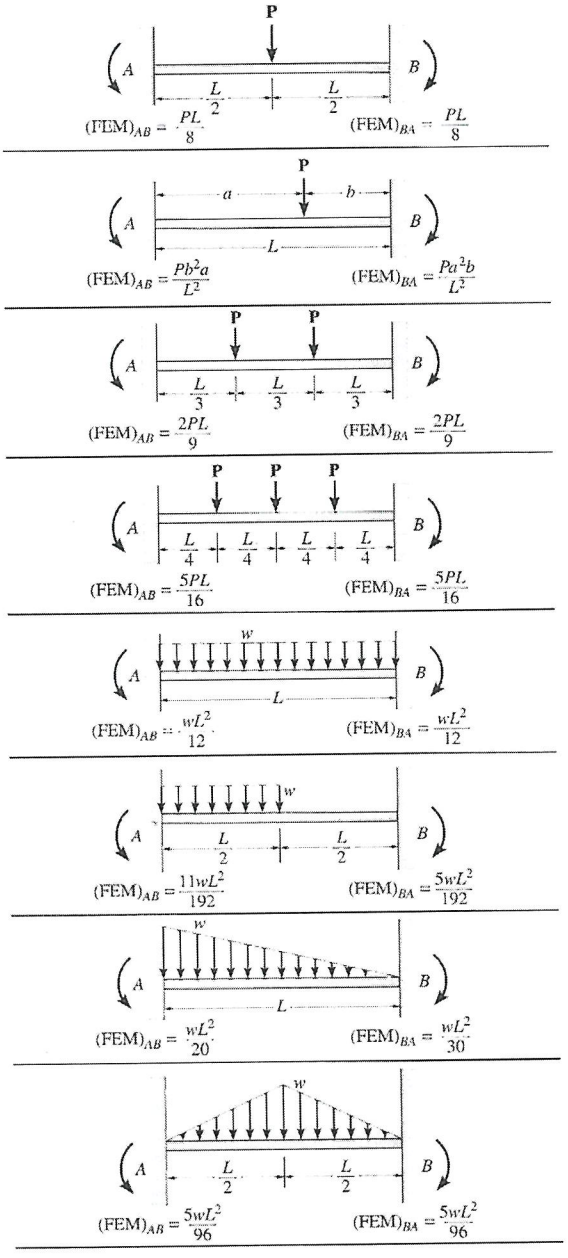
FIXED END MOMENTS:



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