



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

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

COURSE NAME : STRUCTURE ANALYSIS
COURSE CODE : DAC 31502
PROGRAMME : DAA
EXAMINATION DATE : DECEMBER 2018 / JANUARY 2019
TIME : 2 HOURS 30 MINUTES
INSTRUCTION : ANSWER **FOUR (4)** QUESTIONS
ONLY

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THIS QUESTION PAPER CONTAINS **NINE (9)** PAGES

- Q1** (a) Define each of the following and give **ONE (1)** structure example for each of it.
- (i) Tension Structure
 - (ii) Compression Structure
- (4 marks)
- (b) According to **Figure Q1(b)**, determine whether that frame is stable, determinate or indeterminate. If it is indeterminate, calculate the degree of determinacy.
- (8 marks)
- (c) **Figure Q1(c)** shows a truss subjected to a support at point A and F. Calculate the force in all members of the truss shown in the figure.
- (13 marks)
-
- Q2** (a) Define Zero force member in trusses.
- (2 marks)
- (b) Several trusses are designed to have zero force member. Based on **Figure Q2(b)**, identify zero force member in the truss.
- (8 marks)
- (c) In the Fink truss shown in **Figure Q2(c)**, the web members BC and EF are perpendicular to the inclined members at their midpoints. Use the method of sections to compute the force in members DF, DE, and CE.
- (15 marks)
-
- Q3** (a) Define the Principle of Virtual Work.
- (2 marks)
- (b) Calculate the magnitude and direction of the vertical and horizontal displacement at joint D in the truss shown in **Figure Q3(b)**. Assume the $E = 200 \text{ kN/mm}^2$ and the cross sectional area of each bar is given in **Table 1**.
- (15 marks)
- (c) Calculate the forces in the truss shown in **Figure Q3(c)** by force method. Cross sectional area for each member is 200 mm^2 and assume E value is constant.
- (8 marks)

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- Q4** (a) Briefly explain Method of Joint. (3 marks)
- (b) **Figure Q4(b)** shows the truss supported by two external forces of 10kN and 25kN. Based on **Figure Q4(b)** and **Table 2** find the following by assuming the modulus of elasticity is constant:
- (i) Show that the truss is statically indeterminate truss. (2 marks)
 - (ii) Compute the redundant force of the truss. (2 marks)
 - (iii) Calculate the internal forces by using the method of joint or inspection method. (4 marks)
 - (iv) Calculate the internal forces due to 1 unit load. (4 marks)
 - (v) Set up a table to find the final internal forces in all members. (3 marks)
- (c) **Figure Q4(c)** shows a truss supported on pin both at point A and D. The modulus of elasticity and cross sectional area for all the members are 200 kN/mm² and 400 mm² respectively.
- (i) Calculate the determinacy of the truss. (2 marks)
 - (ii) Calculate the forces in all members of the truss. (5 marks)
- Q5** (a) Define a space frame (3 marks)
- (b) Describe three common types of member arrangement that result in zero force member. (6 marks)
- (c) A space frame in **Figure Q5(c)** are connected at A, B, C and D in a horizontal plane through ball and socket joint. The member of EF is at height of 5m above base and load at joint E and F act in a horizontal plane. Calculate internal forces in all members. (16 marks)

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Q6 Figure Q6 shows a frame support at A, C and D.

- (a) Calculate the degree of indeterminacy of the beam. (3 marks)
- (b) Calculate the moment at all joints using the moment distribution method. (10 marks)
- (c) Draw the bending moment diagram for the beam. (6 marks)
- (d) Calculate the reaction at support A, C and D. (6 marks)

- Q7**
- (a) Sketch the stress diagram of a section of a rectangular beam from elastic until the formation of plastic hinge. (5 marks)
 - (b) **Figure Q7(b)** shows a continuous beam loaded as shown in the figure. Calculate the value of M_p (full plastic moment) for each span using:
 - (i) Virtual work methods (9 marks)
 - (ii) Graphical methods. (9 marks)
 - (c) Determine the critical plastic moment and the span that will collapse first. (2 marks)

- END OF QUESTIONS -

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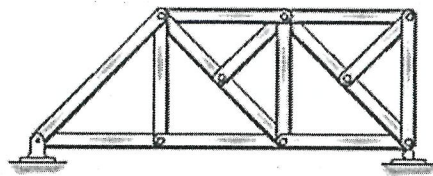
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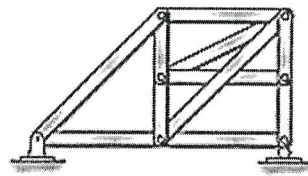
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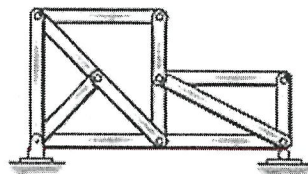
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(a)



(b)



(c)

Figure Q1(b)

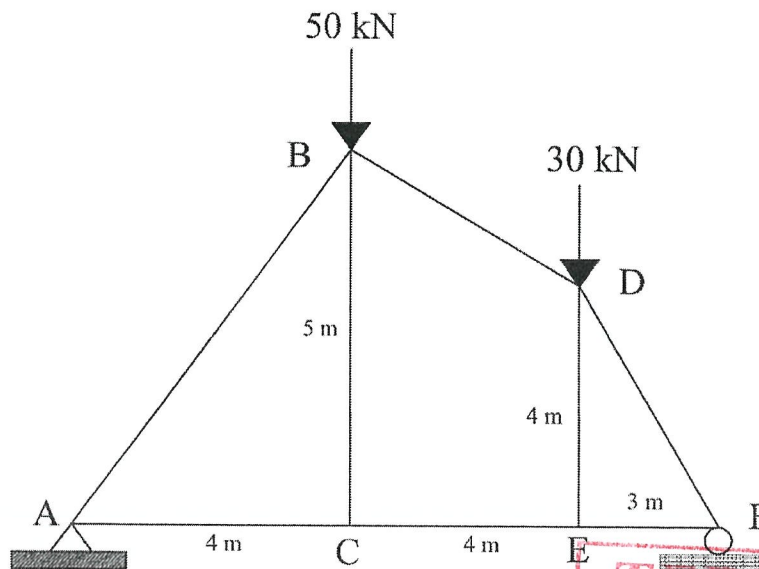


Figure Q1(c)

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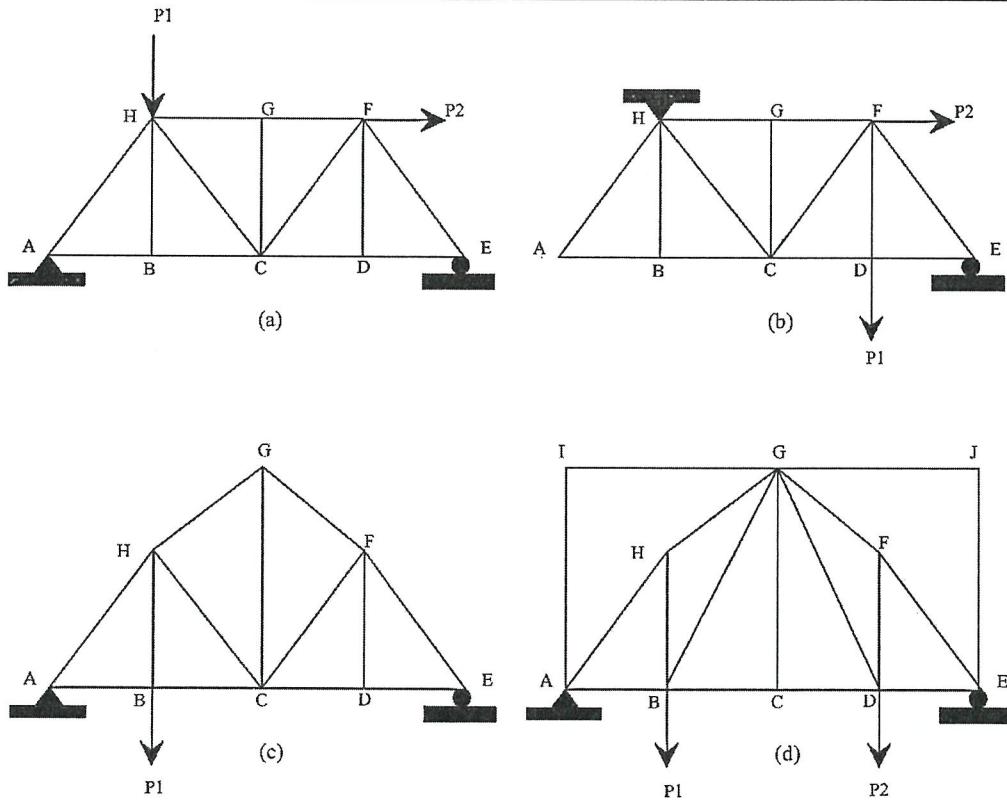


Figure Q2(b)

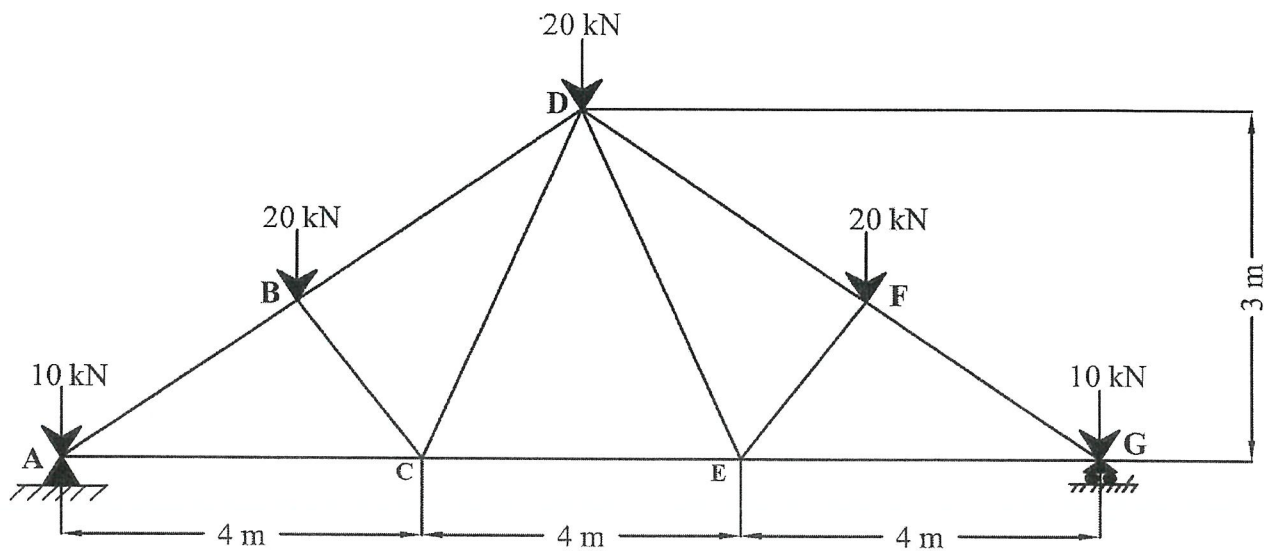


Figure Q2(c)

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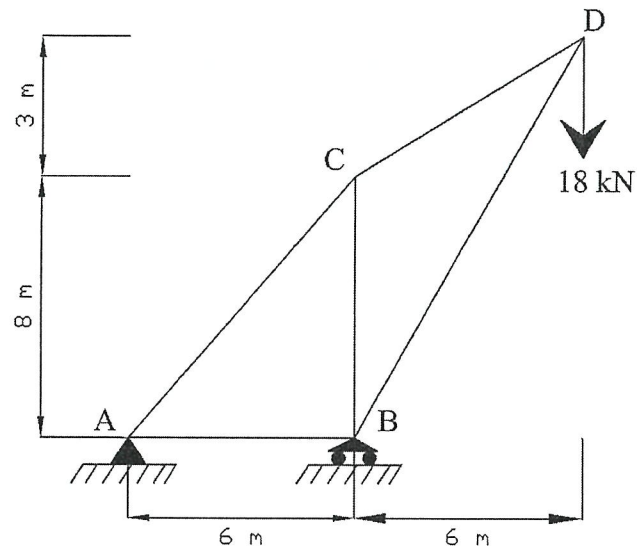


Figure Q3(b)

Table 1

Member	AB	AC	BC	BD	CD
Cross Sectional Area (mm ²)	150	150	200	200	100

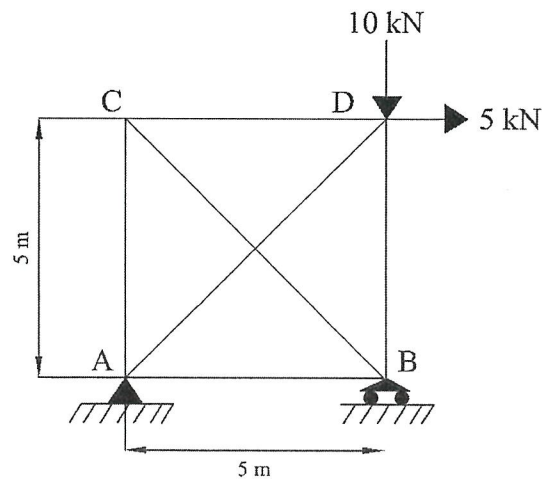


Figure Q3(c)

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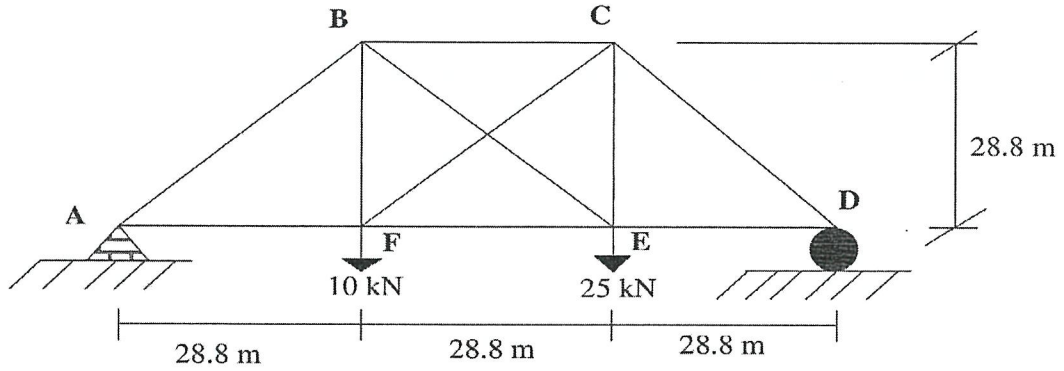


Figure Q4(b)

Table 2

Member	AB	AF	BF	BC	BE	CF	CE	CD	DE	EF
Cross sectional area (mm ²)	200	200	100	200	100	100	100	200	200	200

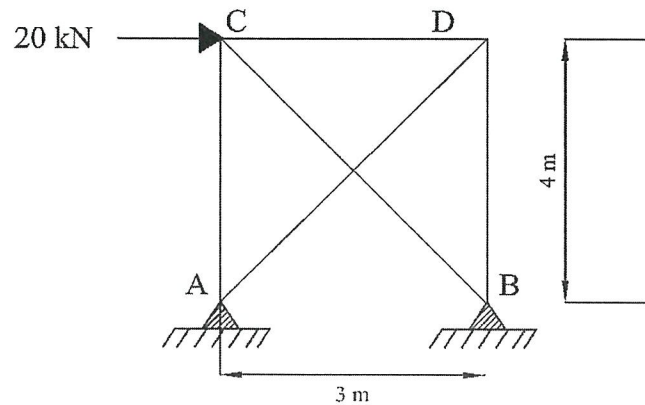


Figure Q4(c)

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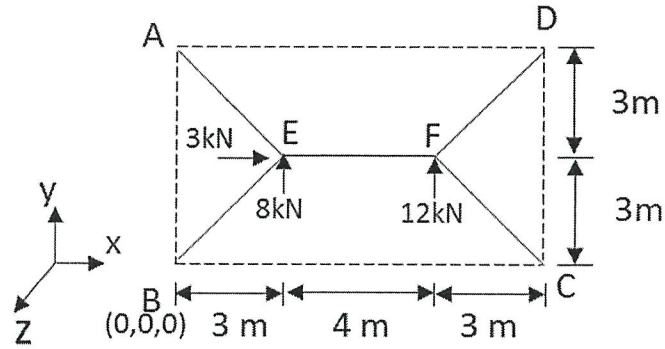


Figure Q5(c)

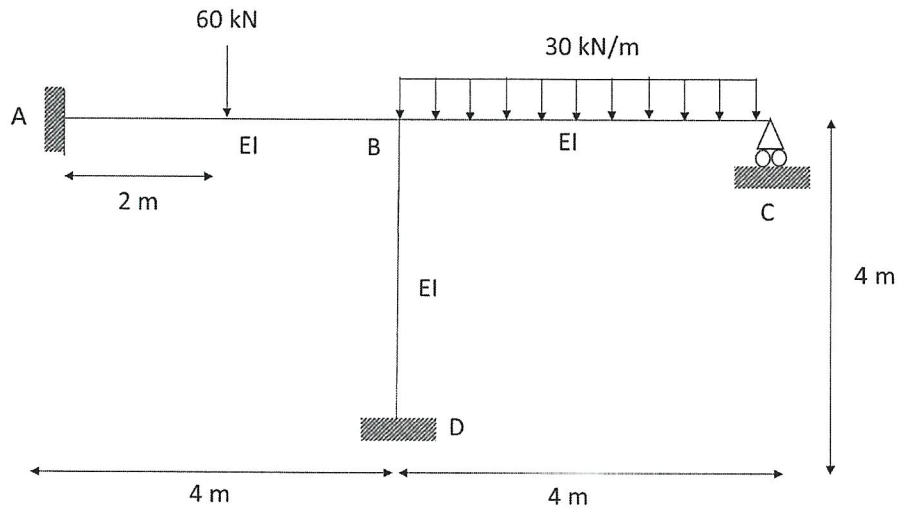


Figure Q6

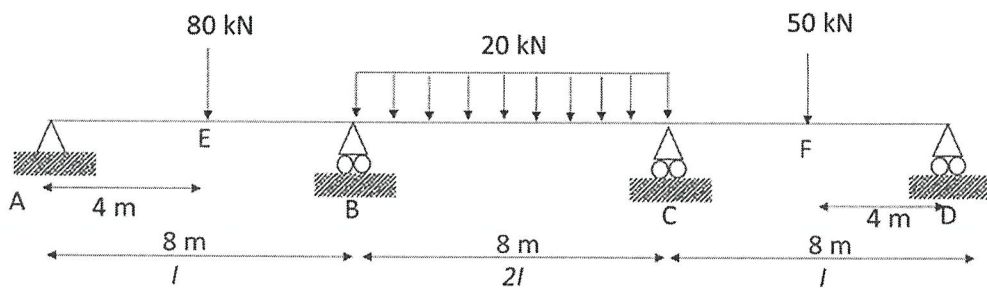


Figure Q7(b)

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