



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2022/2023

- COURSE NAME : STRUCTURAL ANALYSIS
- COURSE CODE : DAC 21503 / DAC 21703
- PROGRAMME CODE : DAA
- EXAMINATION DATE : JULY / AUGUST 2023
- DURATION : 3 HOURS
- INSTRUCTION :
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**

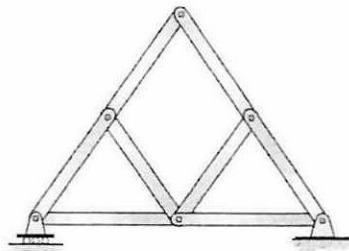
THIS QUESTION PAPER CONSISTS OF **SIX (6)** PAGES

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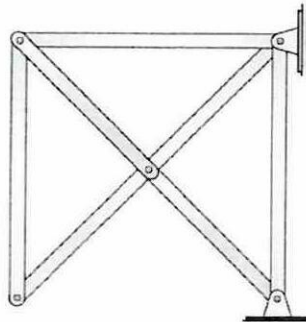
- Q1 (a) List **FOUR (4)** classifications of structures. (4 marks)
- (b) Differentiate between the internal forces and external forces. (4 marks)
- (c) Classify the following trusses as statically determinate, statically indeterminate, or unstable. If the indeterminate structure, state its degree of indeterminacy.

(i)



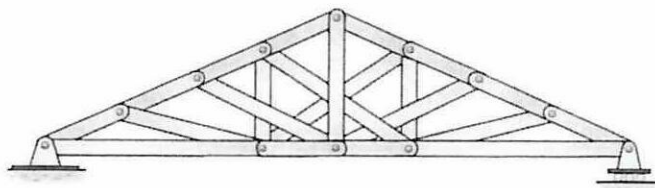
(3 marks)

(ii)



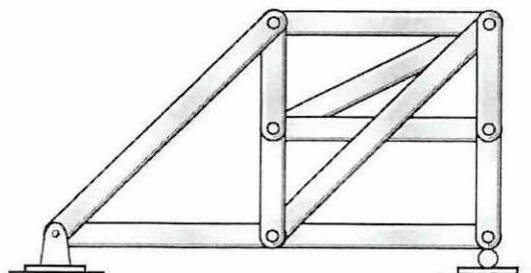
(3 marks)

(iii)



(3 marks)

(iv)



(3 marks)

- Q2 (a) **Figure 2(a)** shows a truss subjected to corresponding loads with pinned support at F and roller support at C with a value of $E = 200\text{MPa}$. By using a method of inspection,

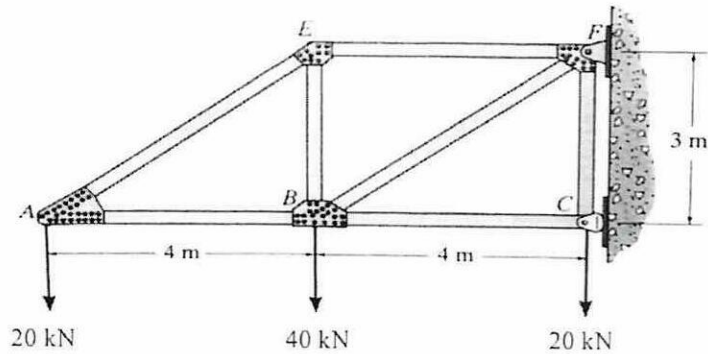


Figure 2(a)

- (i) Determine the reaction force at supports C and F. (5 marks)
 - (ii) Calculate the internal forces in all members. (7 marks)
- (b) A simply supported steel truss is subjected to external force, P as shown in **Figure 2(b)**. Given $E = 200\text{MPa}$ and $P = 8\text{kN}$.

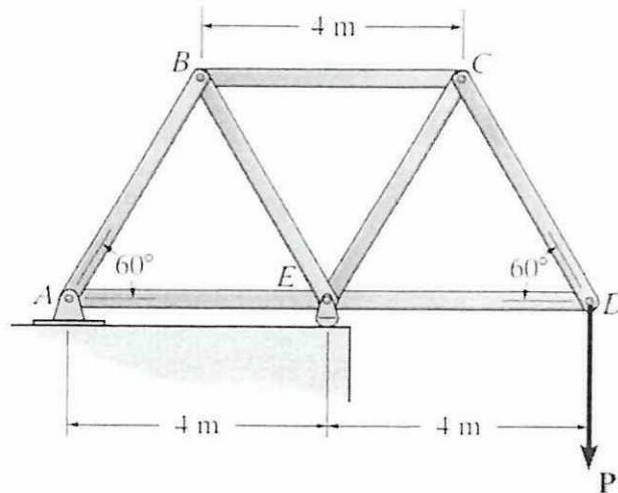


Figure 2(b)

- (i) Determine the reaction force at supports A and E. (5 marks)
- (ii) By using the inspection method, determine the internal force in all members. (7 marks)

- (iii) If the maximum force for members can support 8kN in tension and 6kN in compression, determine the maximum force P that can be supported at joint D.

(6 marks)

- Q3 (a) State **TWO (2)** advantages and **ONE (1)** disadvantage of an indeterminate truss over a determinate truss.

(6 marks)

- (b) **Figure 3(b)** shows a truss with pinned supported at A and roller supported at C and D with a vertical load of 100kN subjected at B.

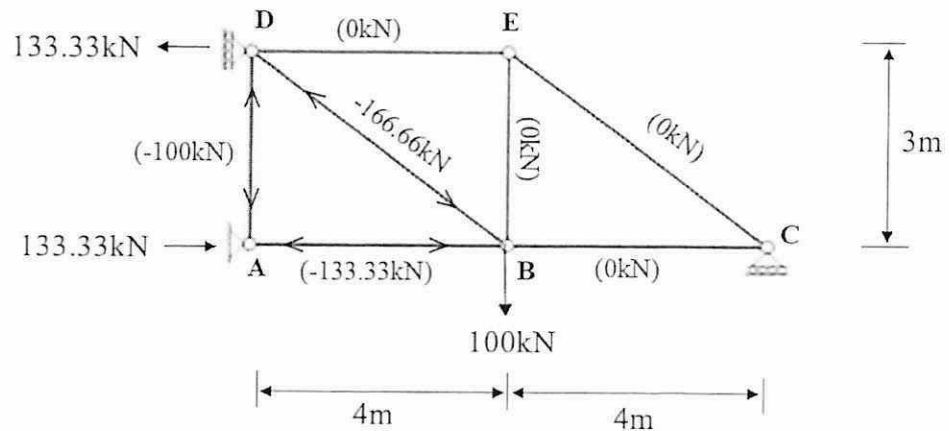


Figure 3(b)

- (i) Prove that the truss is a statically indeterminate truss. (3 marks)
- (ii) Calculate the internal forces in the members due to the unit load by applying a unit load upper vertically at C. (10 marks)
- (iii) Tabulate the overall result and solve the redundant force at C. (4 marks)
- (iv) Determine the final internal force in EC and BC members. (2 marks)

- Q4 (a) In the slope-deflection equation, the end moment is affected by two behaviors. Name these **TWO (2)** behaviors.

(2 marks)

- (b) A continuous beam that is built-in at A and C is subjected to loads as shown in Figure 4(b).

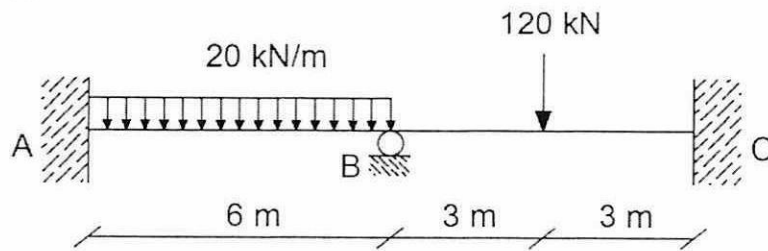


Figure 4(b)

- (i) Determine the degree of indeterminacy of the beam. (3 marks)
- (ii) Write down the slope-deflection equation for span AB and BC. (4 marks)
- (iii) Determine the boundary conditions and the equilibrium of moments at the support. (4 marks)
- (iv) Calculate the fixed-end moments of the beam. (4 marks)
- (v) Determine rotation, θ_B at support B. (4 marks)
- (vi) Determine the end moments of the beam. (4 marks)

- END OF QUESTIONS -

FINAL EXAMINATION

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$$r = 3n$$

$$\frac{d^2v}{dx^2} = \frac{M}{EI}$$

$$m + r = 2j$$

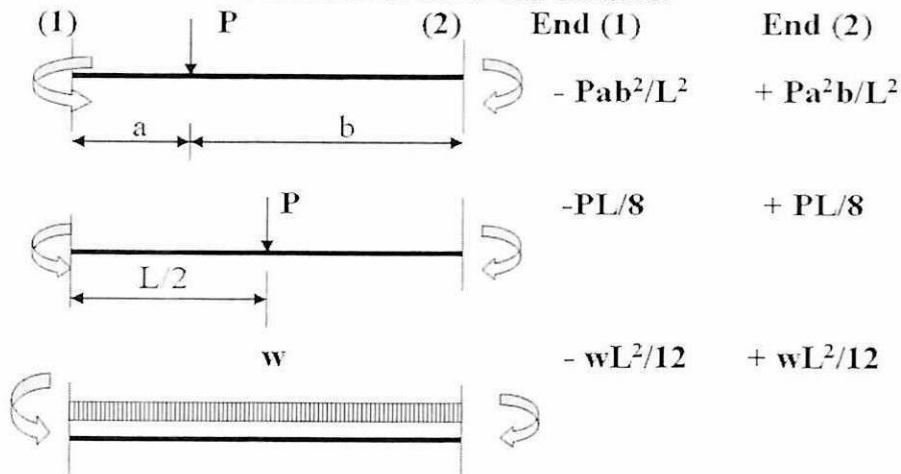
$$1 \cdot \Delta_A = \sum \frac{nNL}{AE}$$

$$1 \cdot \Delta_{AA} = \sum \frac{n^2L}{AE}$$

$$R_A = -\frac{\delta_A}{\delta_{AA}}$$

$$P = N + R_A n$$

Formula for fixed-end-moment



$$M_{1-2} = 2EI/L (2\theta_1 + \theta_2 - 3\delta/L) + M^F_{12} \dots \dots \dots (1)$$

$$M_{2-1} = 2EI/L (2\theta_2 + \theta_1 - 3\delta/L) + M^F_{21} \dots \dots \dots (2)$$

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