



UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER I
SESSION 2023/2024**

COURSE NAME : STRUCTURAL ANALYSIS

COURSE CODE : DAC 21703

PROGRAMME CODE : DAA

EXAMINATION DATE : JANUARY / FEBRUARY 2024

DURATION : 3 HOURS

INSTRUCTION : 1. ANSWER ALL QUESTIONS

2. THIS FINAL EXAMINATION IS CONDUCTED VIA **CLOSED BOOK**.

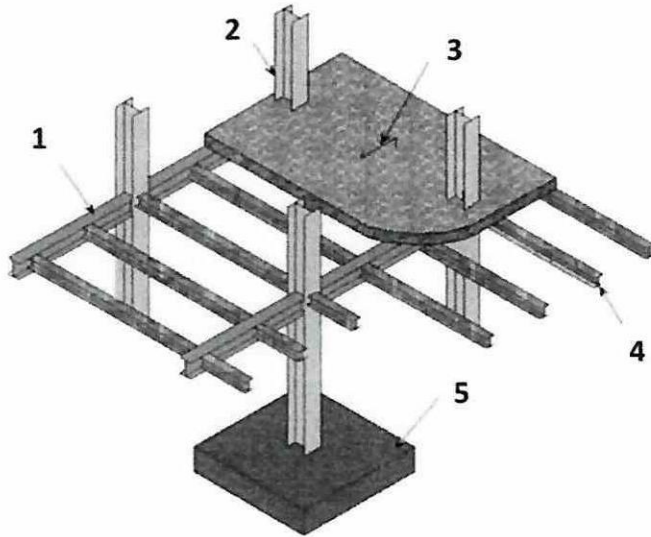
3. STUDENTS ARE **PROHIBITED** TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA **CLOSED BOOK**

THIS QUESTION PAPER CONSISTS OF SEVEN (7) PAGES

TERBUKA

CONFIDENTIAL

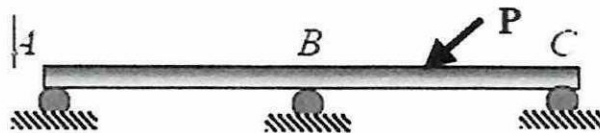
- Q1** (a) List **FIVE (5)** classifications of structures. (5 marks)
- (b) Names **FIVES (5)** of the components of structures based on the figure.



(5 marks)

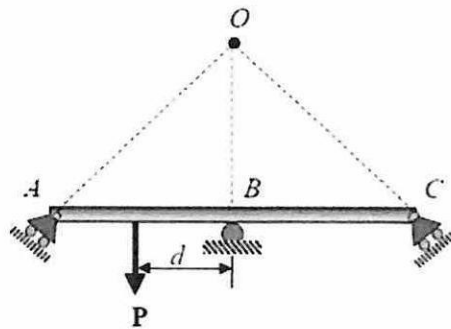
- (c) Draw the free body diagram:

(i)



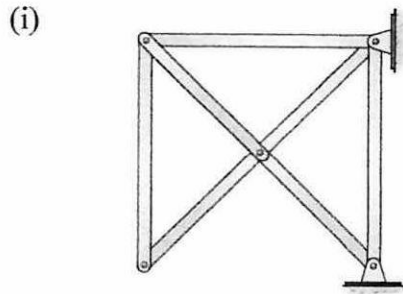
(2 marks)

(ii)

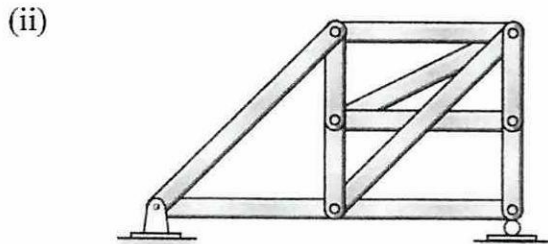


(2 marks)

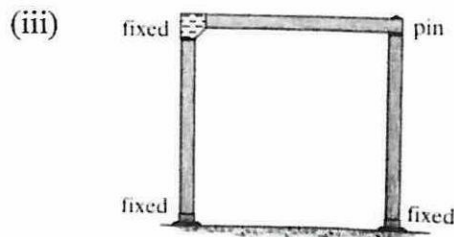
- (d) Classify the following structures as statically determinate, statically indeterminate, or unstable. If the indeterminate structure, state its degree of indeterminacy.



(4 marks)



(3 marks)



(4 marks)

Q2 (a) List and explain **THREE (3)** methods for truss analysis.

(6 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 $P = 10\text{kN}$.

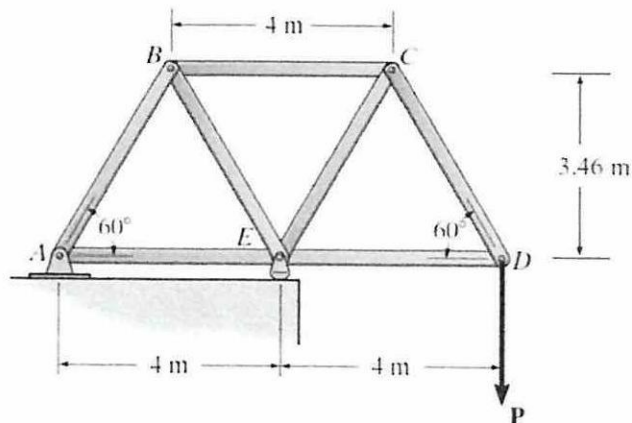


Figure 2(b)

- (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. (14 marks)

- Q3**
- (a) State the equations of a determinate truss and indeterminate truss. (2 marks)
 - (b) **Figure 3(b)** shows a truss with pinned and roller at their support.

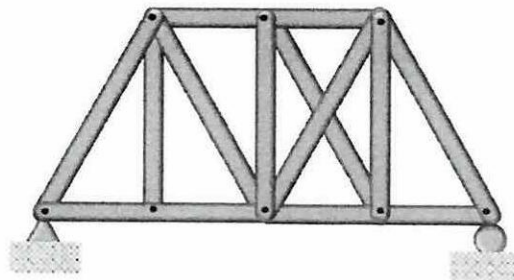


Figure 3(b)

- (i) Classify the trusses as statically determinate, indeterminate, or unstable. If the indeterminate structure, state its degree of indeterminacy. (4 marks)
 - (ii) Classify the truss as either external or internal redundancy. (2 marks)
- (c) **Figure 3(c)** shows a truss with pinned support at A and B with a vertical load of 10kN subjected at C.

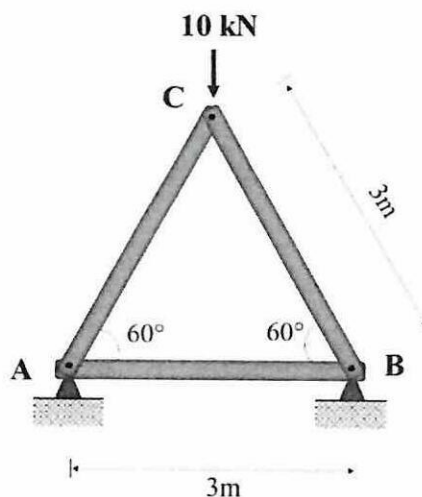


Figure 3(c)

- (i) Determine the determinacy of the structure. If the indeterminate structure, state its degree of indeterminacy. (4 marks)
- (ii) Identify the redundant member of support. (2 marks)
- (iii) Draw the structure after removing redundant members at point B. (2 marks)
- (iv) Calculate the reaction force on the support. (5 marks)
- (v) Calculate the internal forces due to the 10kN force as vertical load. (3 marks)
- (vi) Calculate the reaction forces on the support due to the unit load horizontally at B. (1 marks)

Q4 (a) Define the space frame with the aid of a figure. (3 marks)

(b) Assume all supports are ball-and-socket in the space frame as shown in **Figure 4(b)**. Point loads are applied at points E and D with the origin at point A.

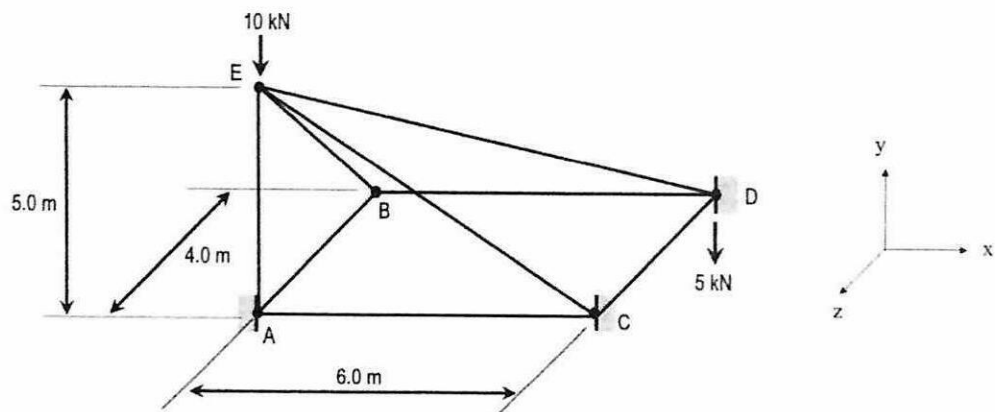


Figure 4(b)

- (i) Find the total reaction force in the space frame. (2 marks)
- (ii) Determine the coordinates of the joints A, B, C, D, and E. (5 marks)
- (iii) Calculate the coefficients of the DC and DE members in the space frame. (6 marks)

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

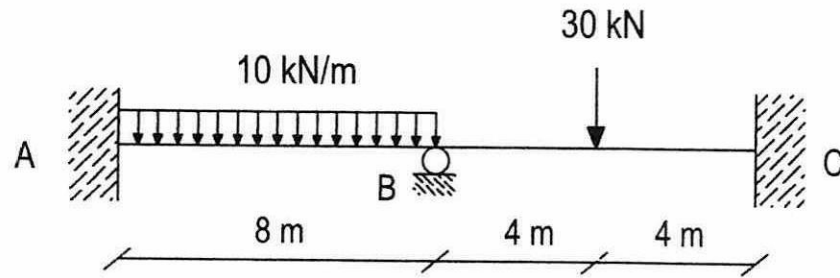


Figure 4(c)

- (i) Determine the degree of indeterminacy of the beam. (4 marks)
- (ii) Write down the slope-deflection equation for span AB and BC. (4 marks)
- (iii) Determine rotation, θ_A at support B. (1 marks)

- END OF QUESTIONS -

FINAL EXAMINATION

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$$r = 3n$$

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

$$m + r = 2j$$

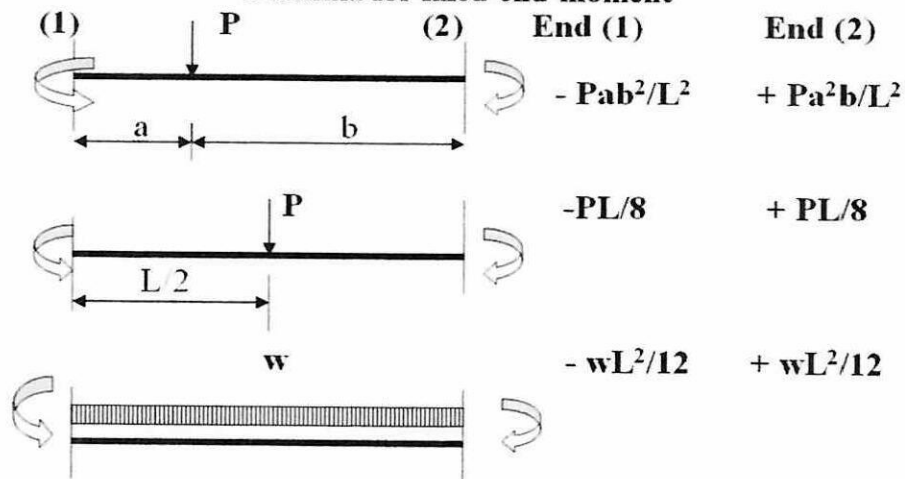
$$1 \cdot \Delta_A = \sum \frac{nNL}{AE}$$

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

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

$$P = N + R_A n$$

Formula for fixed-end-moment



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

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