Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2021/2022

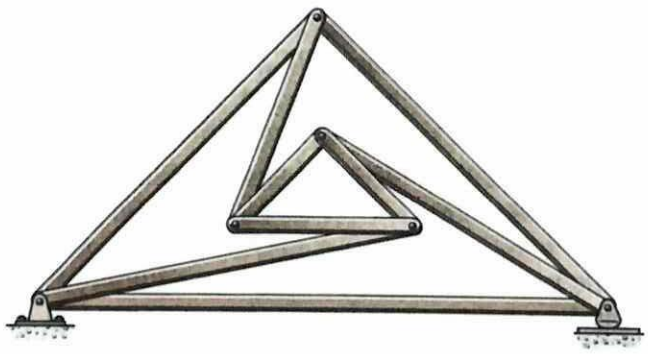
COURSE NAME	:	STRUCTURAL ANALYSIS
COURSE CODE	:	DAC 21703
PROGRAMME CODE	:	DAA
EXAMINATION DATE	:	JANUARY / FEBRUARY 2022
DURATION	:	3 HOURS
INSTRUCTION	:	1. SECTION A: ANSWER **ALL** QUESTIONS. 2. SECTION B: ANSWER **TWO** QUESTIONS ONLY 3. THIS FINAL EXAMINATION IS AN **ONLINE** ASSESSMENT AND CONDUCTED VIA **OPEN BOOK**

THIS QUESTION PAPER CONSISTS OF **SEVEN (7)** PAGES

SECTION A

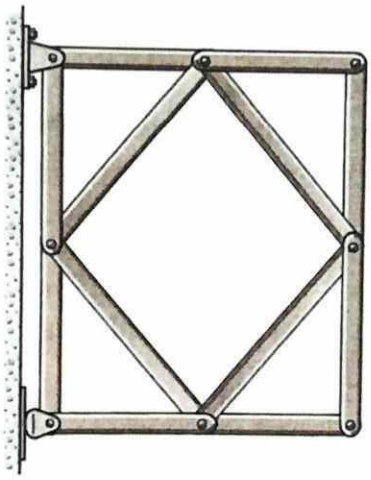
Q1 (a) Classify the following trusses as statically determinate, statically indeterminate or unstable. If indeterminate structure, state its degree of determinacy.

(i)



(2 marks)

(ii)



(2 marks)

(b) A simply supported steel truss is subjected to external force as shown in **Figure 1(b)**. Given E = 200 MPa,

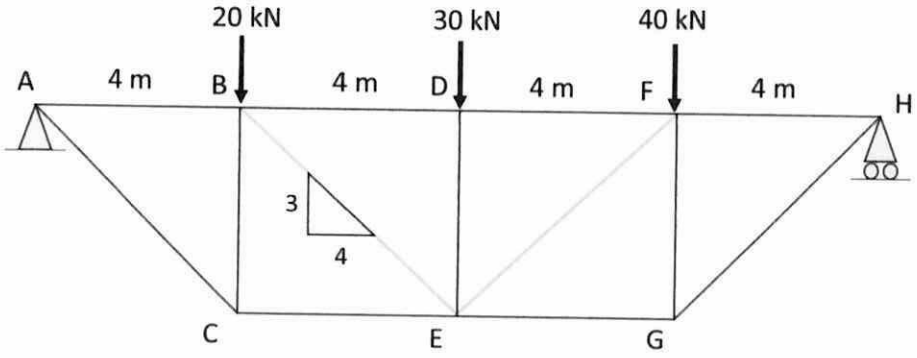


Figure 1(b)

(i) determine the truss determinacy.

(3 marks)

(ii) determine the support reactions at point A and H.

(5 marks)

(iii) by using method of inspection, determine the internal forces in each member of the truss.

(13 marks)

Q2 (a) Define the meaning of Virtual Forces, n.

(2 marks)

(b) A steel truss is subjected to external forces as shown in **Figure Q2(b)**. Given the cross section area, $A = 400\ mm^2$ and $E = 200$ GPa for each member. Use the inspection method.

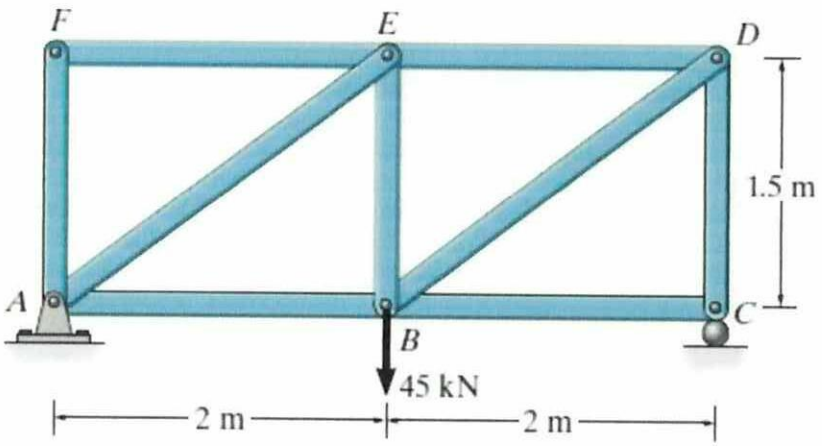


Figure Q2(b)

(i) Determine the support reactions at A and C.

(3 marks)

(ii) Determine the real forces for all member of the truss.

(7 marks)

(iii) Determine the internal forces due to 1-unit load of virtual work applied vertically at E.

(7 marks)

(iv) Determine the vertical displacement at joint *E* of the truss.

(6 marks)

SECTION B

Q3 **Figure Q3** shows a statically indeterminate truss ABCD supported by pin at A and D. Vertical point load of 50 kN is applied at B and C respectively. Given the cross-sectional area and modulus of elasticity for all members is 1,500 mm^2 and 210,000 N/mm^2 respectively.
By assigning reaction D_x as redundant,

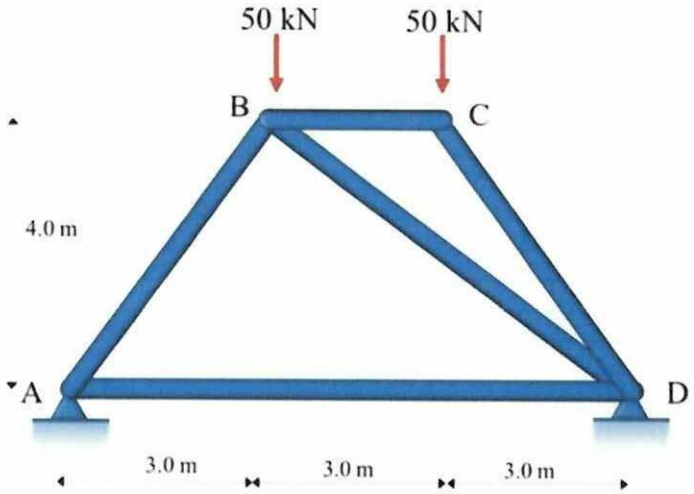


Figure Q3

(a) calculate all real force in truss members knowing that support reaction Ay = Dy = 50 kN and Ax = 0 kN.

(5 marks)

(b) calculate supports reaction and all virtual force in truss members due to 1 unit virtual load at D_x, and calculate the length of each members.

(4 marks)

(c) construct an appropriate table and perform necessary calculation to determine magnitude and direction of redundant D_x.

(7 marks)

(d) determine all actual members force and all support reactions.

(4 marks)

(e) sketch the truss to shows all final value of magnitude and sense of reactions and internal force in members.

(5 marks)

Q4 The **Figure Q4** shows plan and elevation view of a space frame which is supported with ball and socket at A, B and C. A point load of 15kN is applied at D. Determine;

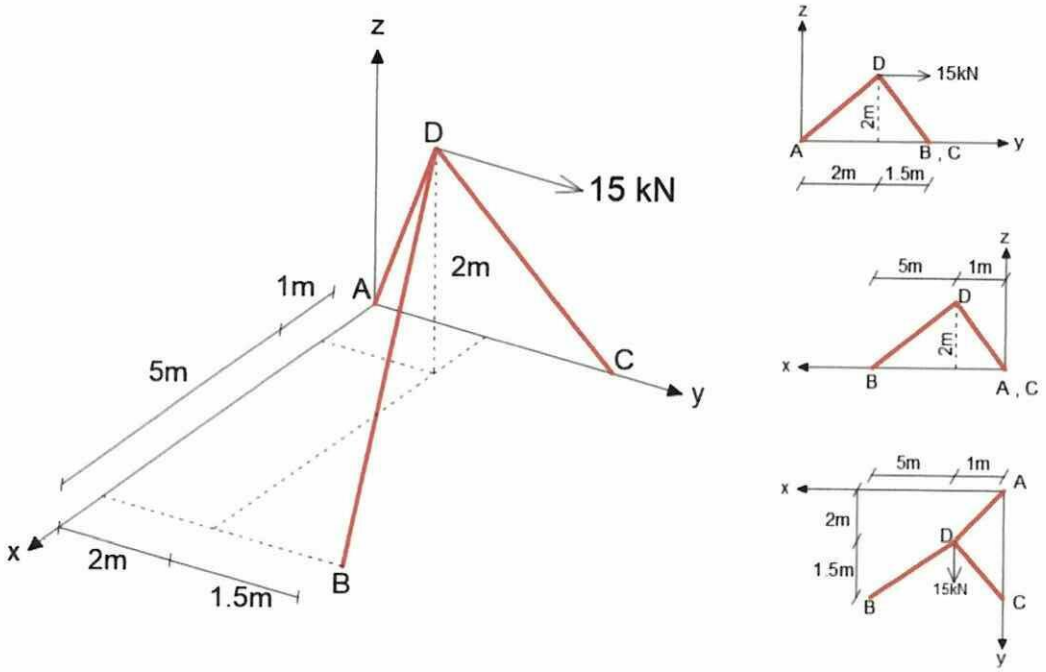


Figure Q4

(i) the frame determinancy

(2 marks)

(ii) the coordinate of each point

(4 marks)

(iii) the equation of equilibrium at point D

(6 marks)

(iv) the tension coefficient for each member

(6 marks)

(v) the force in each member by using tension coefficient method

(7 marks)

Q5 (a) Before applying moment distribution method in analyzing indeterminate beam, list **TWO (2)** information that are requirement and need to be determined.

(2 marks)

(b) Calculate distribution factor (DF) for continues beam shown in **Figure Q5(b)**.

(5 marks)

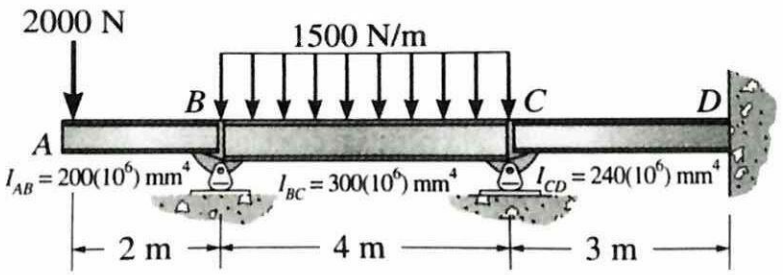


Figure Q5(b)

(c) **Figure Q5(c)** below shows continues beam with fixed end support at both ends and two pin support at B and C. The beam carried uniformly distributed load and point load. **Table 1** is given for stiffness factor.

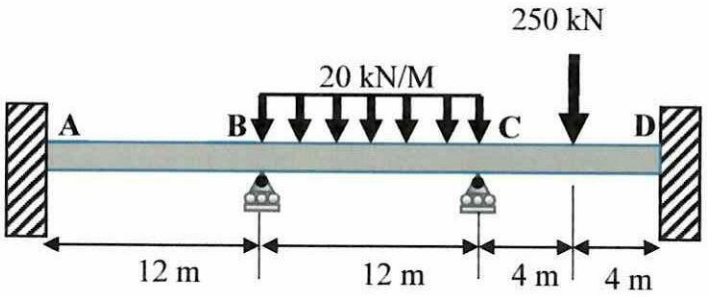


Figure Q5(c)

Table 1: Stiffness factor

Member	Stiffness Factor
AB	$\frac{4EI}{12}$
BC	$\frac{4EI}{12}$
CD	$\frac{4EI}{8}$

(i) Determine distribution factor for each member of the beam.

(5 marks)

(ii) Calculate fixed end moments

(5 marks)

(iii) Determine the internal moments at each member of the beam by doing moment distribution for four (4) cycle.

(8 marks)

-END OF QUESTIONS