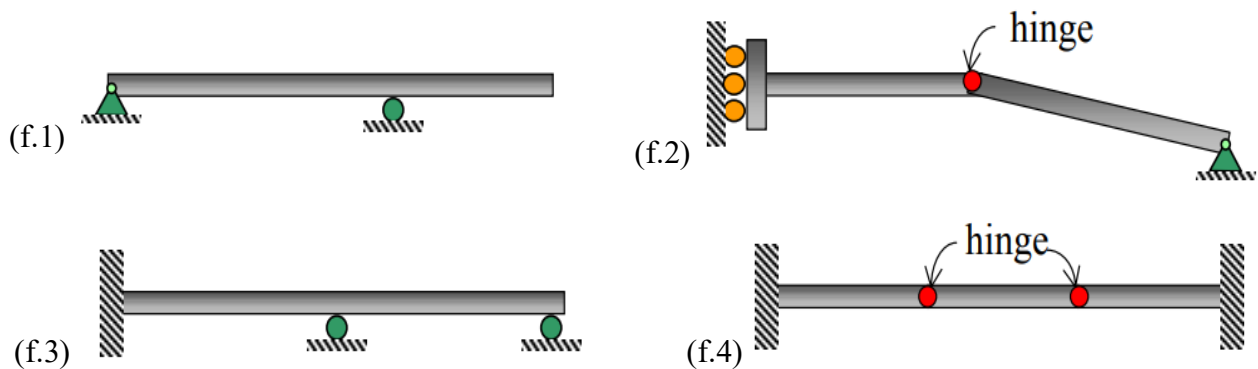


Programme:	BSc Civil Engineering		
Module:	Structural Design		
Module code:	ACBA 6007	Contribution to Overall Module Assessment (%):	50%
Lecturer:	Dr Jamiu A. Dauda	Internal Verifier:	Dr Deborah Hughes
Assessment Title:	Examination	Word count (or equivalent):	N/A
Date:	14th January 2022	Time:	9:00 am – 11:00 am (2 Hours)
Instructions to Candidates	Answer all questions in SECTION A, one question from SECTION B, and one from SECTION C. Section A carries 40 marks while all questions in sections B and C carry equal marks (30 marks each). For this examination, you are supplied with a Fixed End Moments Table for (Q2 and Q3).		

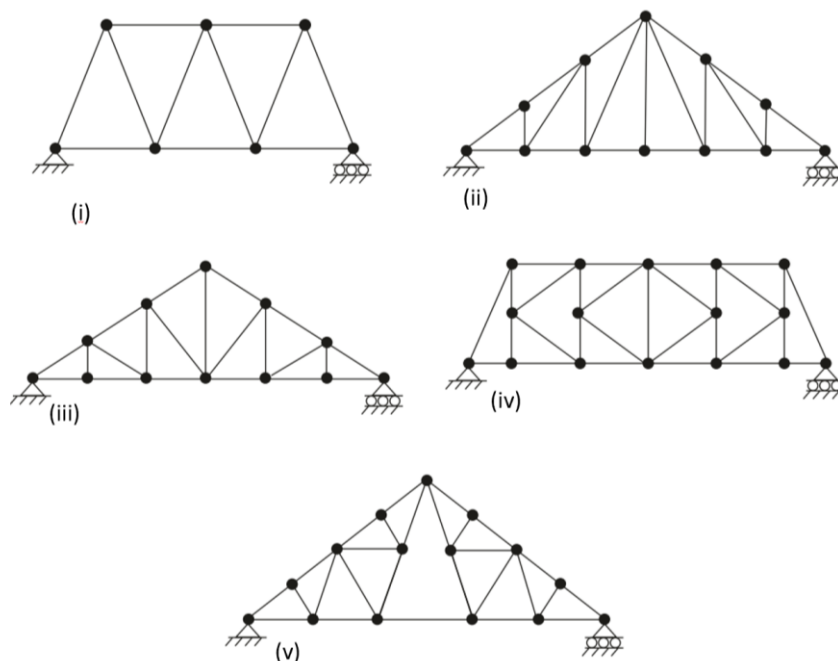
SECTION A (COMPULSORY)

Question 1 (40 Marks): Answer all questions

- a) Name and illustrate with diagram, the three most common types of supports used in beam (6 marks)
- b) Identify with diagram the reactions forces associated with each support type mentioned in question 1(a) above (3 marks)
- c) Differentiate between determinate structure and indeterminate structure (2 marks)
- d) State the three conditions of static equilibrium conditions and write the three static equilibrium equations (6 marks)
- e) What is the equation for classifying structures as statically determinate or statically indeterminate (4 marks)
- f) Classify each of the beams in f1 - f4 below as determinate or indeterminate. If statically indeterminate, report the number of degrees of indeterminacy (6 marks)



- g) Define framed structure and give the two basic classifications of frame structure in structural analysis (3 marks)
- h) What is the difference between over rigid and under rigid truss (2 marks)
- i) What is the equation for classifying trusses as rigid or non-rigid truss (3 marks)
- j) Identify the type of the truss in the figures below (5 marks)



SECTION B

Answer only one question from questions 2 and 3

Question 2

2 (a) Calculate the support reaction for the beam shown in figure Q2. The beam has varying bending stiffness (EI) as indicated in the figure. (20 marks)

2 (b) Using the support reaction calculated above in Q2(a), calculate and draw the bending moment diagram and shear force diagram for the beam. (10 marks)

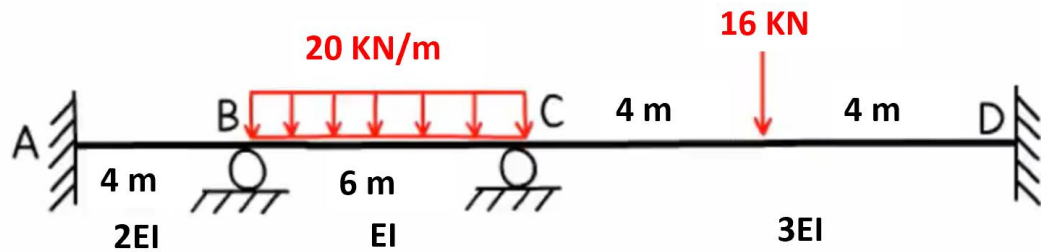


Figure Q2

Question 3

3 (a) Using the moment distribution method, compute the final end moment for the frame shown in figure Q3. The frame has uniform bending stiffness (EI). (20 marks)

3 (b) Using the final end moment calculated above in Q3(a), calculate the support reaction for the frame. (10 marks)

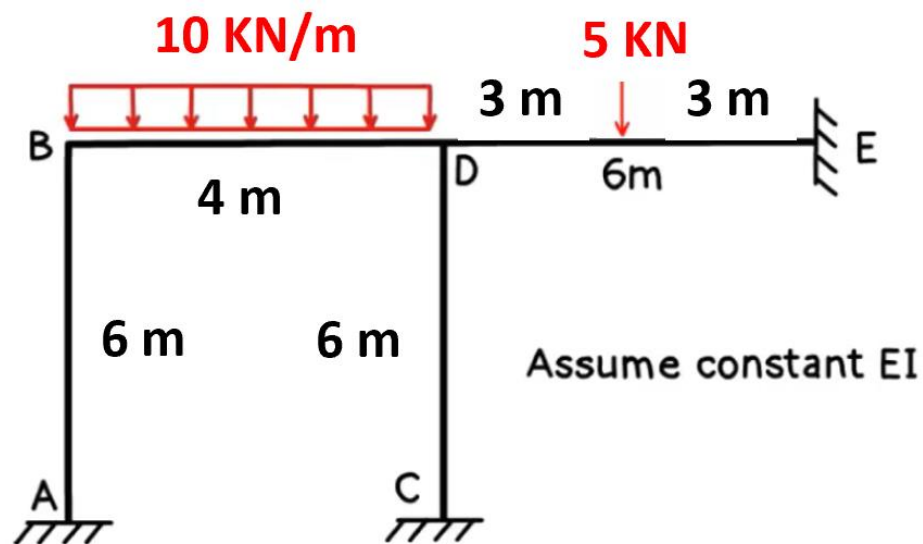


Figure Q3

SECTION C

Answer only one question from questions 4 and 5

Question 4

4. Using the method of joint, find the forces in all the members of the loaded truss shown in Figure Q4. Joint D and F are the middle points of AE and BE respectively. (30 marks)

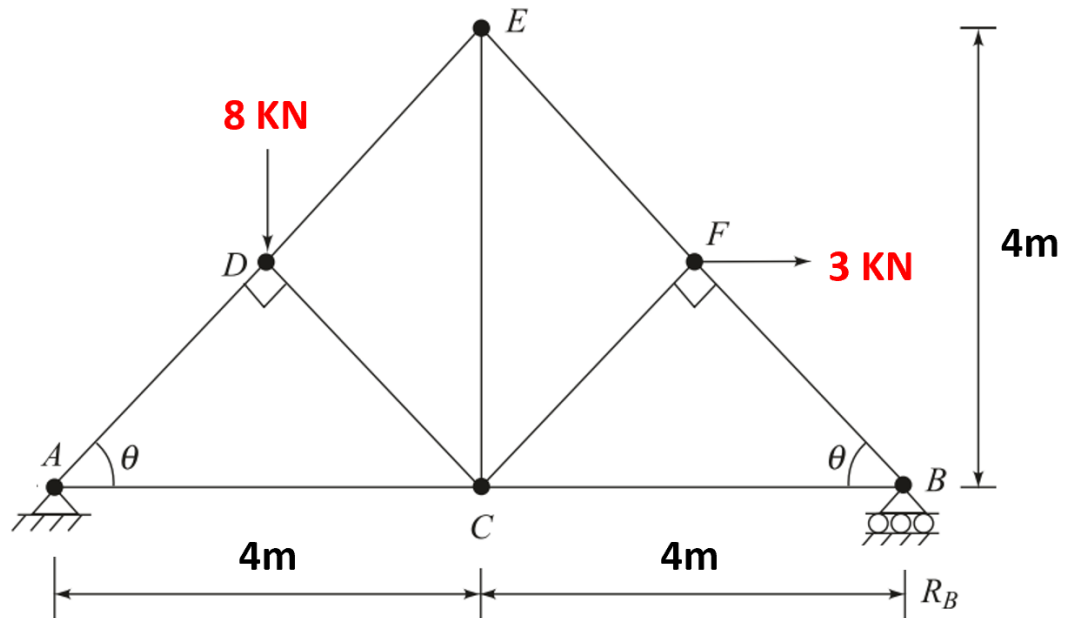


Figure Q4

Question 5

2 (a) Using the method of section, find the forces in members AB, HG, GC, CD, GF, GD, and BF of the loaded truss shown in Figure Q5. (30 marks)

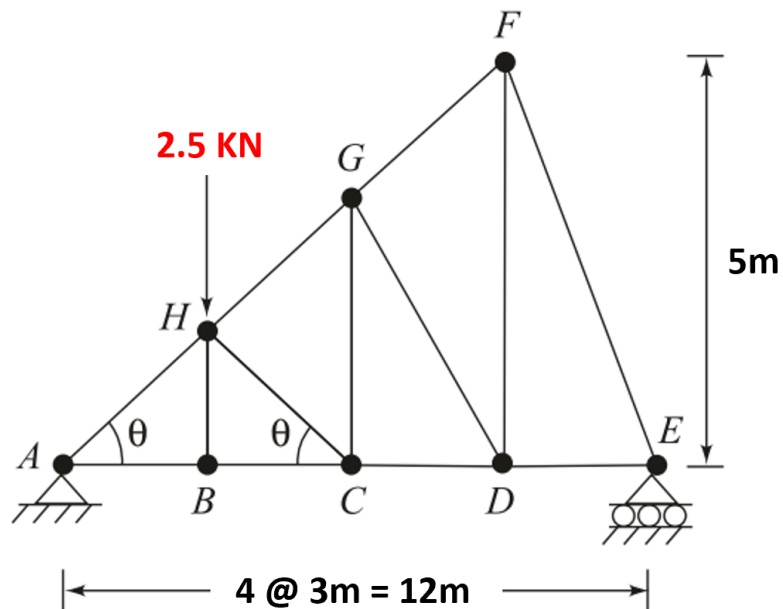
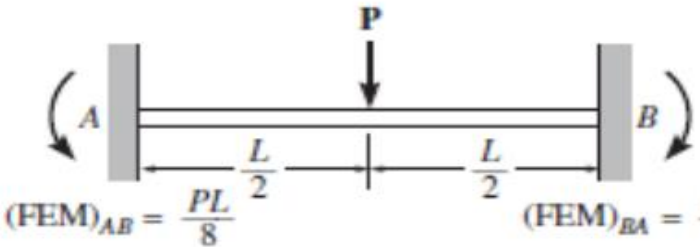
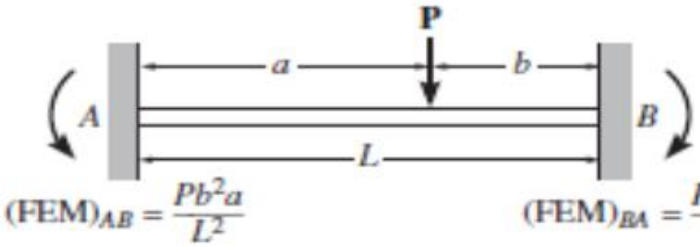
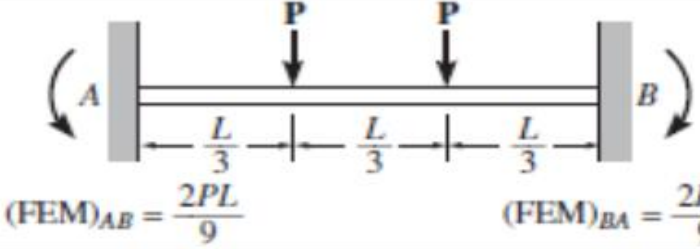
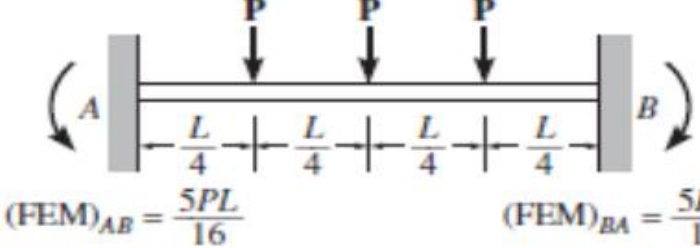
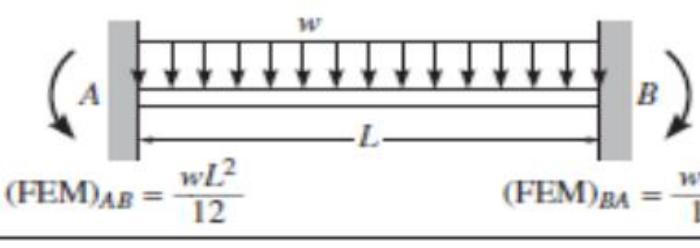
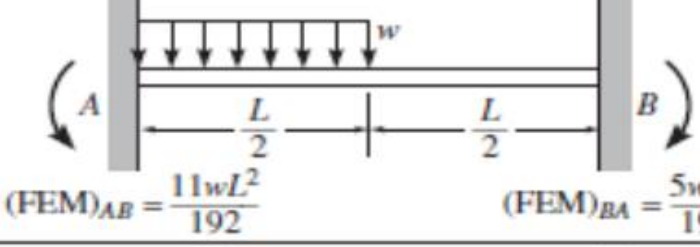
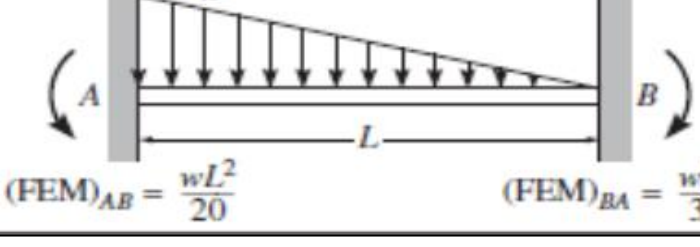


Figure Q5

FIXED END MOMENT TABLE FOR Q2 AND Q3

 $(FEM)_{AB} = \frac{PL}{8}$ $(FEM)_{BA} = \frac{PL}{8}$
 $(FEM)_{AB} = \frac{Pb^2a}{L^2}$ $(FEM)_{BA} = \frac{Pa^2b}{L^2}$
 $(FEM)_{AB} = \frac{2PL}{9}$ $(FEM)_{BA} = \frac{2PL}{9}$
 $(FEM)_{AB} = \frac{5PL}{16}$ $(FEM)_{BA} = \frac{5PL}{16}$
 $(FEM)_{AB} = \frac{wL^2}{12}$ $(FEM)_{BA} = \frac{wL^2}{12}$
 $(FEM)_{AB} = \frac{11wL^2}{192}$ $(FEM)_{BA} = \frac{5wL^2}{192}$
 $(FEM)_{AB} = \frac{wL^2}{20}$ $(FEM)_{BA} = \frac{wL^2}{30}$