Course Title: STRUCTURAL MECHANICS   **Course Code:** CVE 312
Instruction: Attempt **ANY FOUR** questions   **Time allowed:**   3 hours.   **Units:** 3

Question 1 (25 marks)

The trusses in Figure Q1 are subjected to arbitrary external loadings that are assumed to be known & can act anywhere on the trusses. Determine the stability and determinacy of trusses a, b, c, and d.
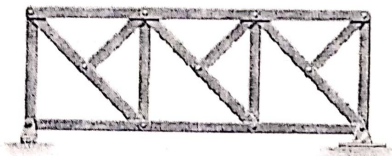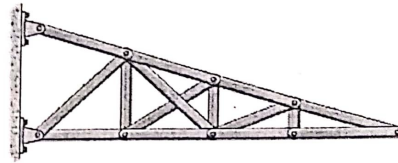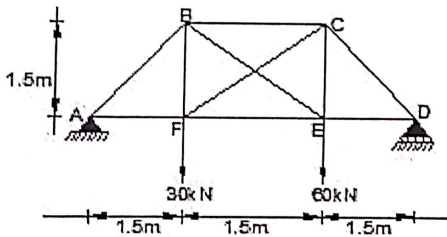

(a)
Figure Q1a (**5 marks**)
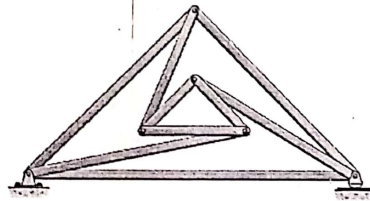

Figure Q1b (**5 marks**)

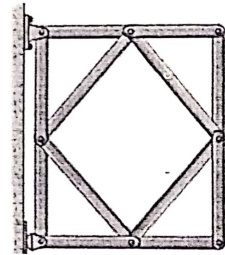Figure Q1c (**5 marks**)

Figure Q1d (**5 marks**)

Figure Q1e (**5 marks**)

Question 2 (25 marks)

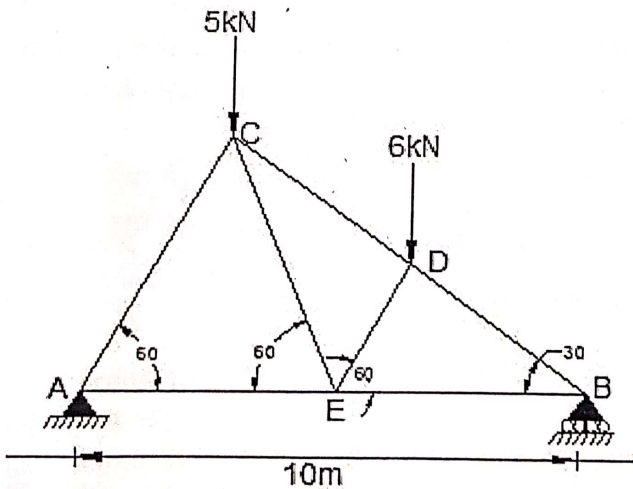Use graphical method **only** to analyse the truss in Figure Q2 presented as follows:
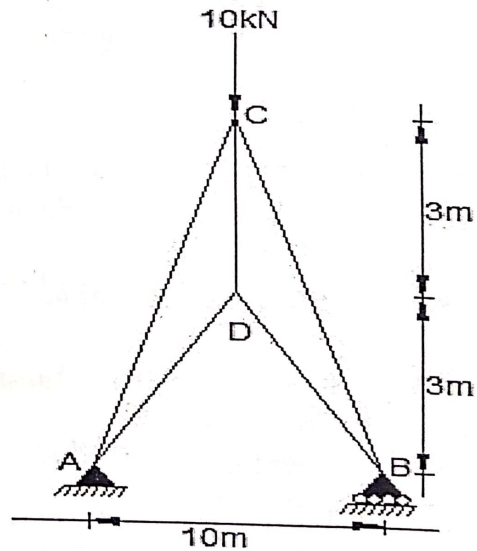

Figure: Q2a   (**13 marks**)

Figure: Q2b   (**12 marks**)

Question 3 (25 marks)

Draw the Bending moment diagram and Shear force diagram of beams in figure Q3 as shown as follows:
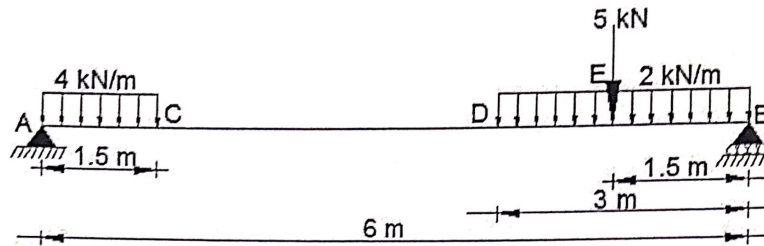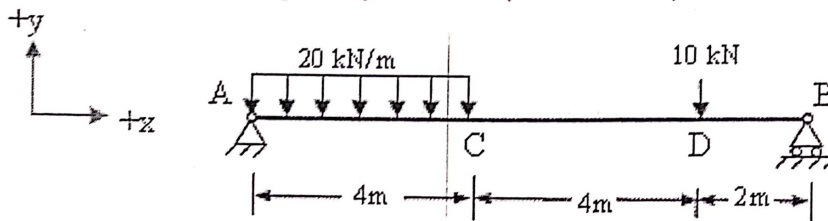

Figure Q3a   (12.5 marks)

Figure Q3b   (12.5 marks)

Question 4 (25 marks)

a) Determine the equation for slope and deflection of a simply supported beam shown in Figure Q4a using moment area method.   (13 marks)
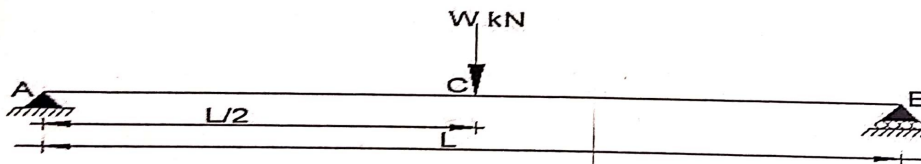

Figure Q4a: Simply Supported Beam

b) A simply supported beam is 5 m long and has a load of 50 kN/m accros its span. The deflection at the centre is 3 mm downwards. The modulus of elasticity is 205 GPa. The beam has a solid rectangular section with a depth 3 times the width. (D=3B). Determine
  (i)   the flexural stiffness   (6 marks)
  (ii)   the dimensions of the section.   (6 marks)

Question 5 (25 marks)

Explain the following terms
(a)   Bending moment and shear force   (5 marks)
(b)   Beam and types of beam   (10 marks)
(c)   Write a complete note on of loads in structural engineering   (3 marks)
(d)   Supports and reactions in structural engineering   (7 marks)

Question 6 (25 marks)

a. Draw the Bending moment diagram and Shearing force diagram of the beam shown in Figure Q6a.   (8 marks)
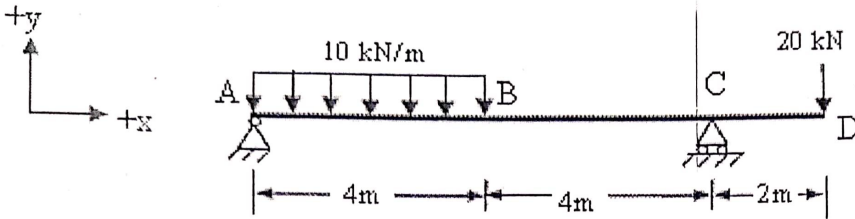

Figure Q6a: Overhang Beam

b) Determine the force in members CF and GC of the roof truss in Figure Q6b. State whether the members are in tension or compression. Use method of Section **only**   (5 marks)
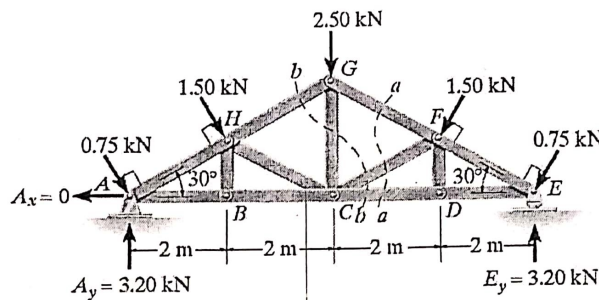

Figure Q6b: Truss

c) Determine the force in each member of the roof truss in Figure Q6c. State whether the members are in tension or compression. Use method of joint **only**.   (7 marks)
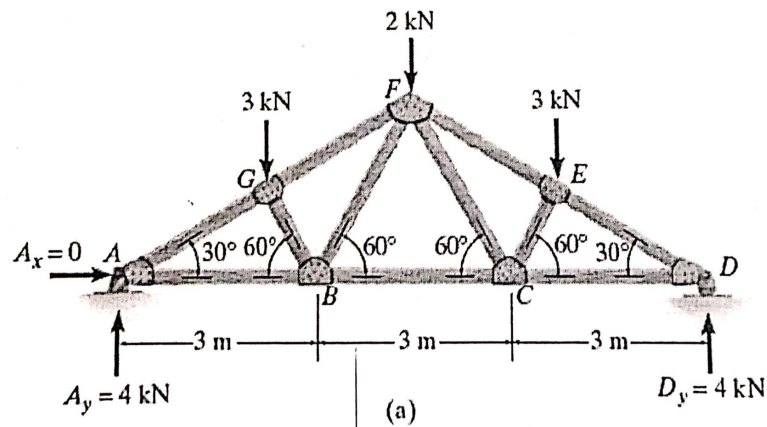

Figure Q6c: Truss

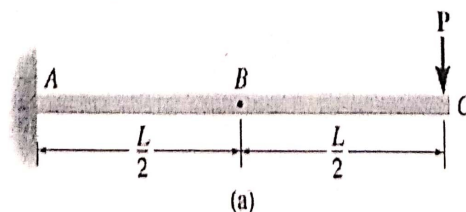d) Determine the slope and deflection of the beam shown in Figure Q6d at pts B and C. EI is constant. use moment area method **only**.   (5 marks)

Figure Q6d: Cantilever Beam