UNIVERSITI SAINS MALAYSIA

1st. Semester Examination
2000/2001 Academic Session

SEPTEMBER / OCTOBER 2000

EAS251/3 – Theory Of Structure I

Time : [3 hours]

Instruction to candidates:-

1. This paper consists of **SEVEN** (7) questions. Answer **FIVE (5)** questions only. **Two** questions from each Section A and B. One question from either Section A or B.

2. Answers **MUST BE** written in Bahasa Malaysia.

SECTION A

1. (a) Classify the plane truss shown in Figure 1 as unstable, statically determinate or statically indeterminate.

(2 marks)

(b) Determine the member forces for the truss shown in Figure 1 and classify whether they are in tension or compression.

(14 marks)

(c) Check the forces for members BC, CF and FE by the method of graphics. Sketch the Maxwell diagram using normal Bow notation.

(4 marks)

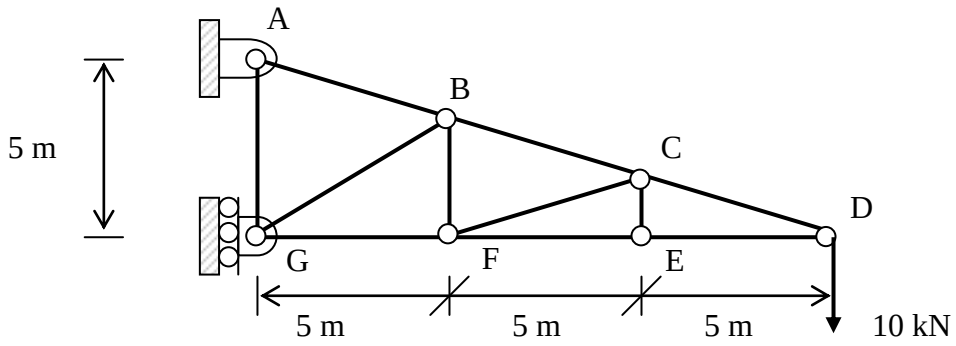

Figure 1

2. (a) Cable EBCF shown in Figure 2, is constructed to carry 2 kN/m uniformly distributed load of the beam AD and a point loads of 3 kN and 5 kN. Support E is 3m higher than support F.
Find: (i) reactions at E and F.
(ii) the maximum tensile force of the cable. (12 marks)

(b) Sketch the shear force and bending moment diagram of beam AD. (8 marks)

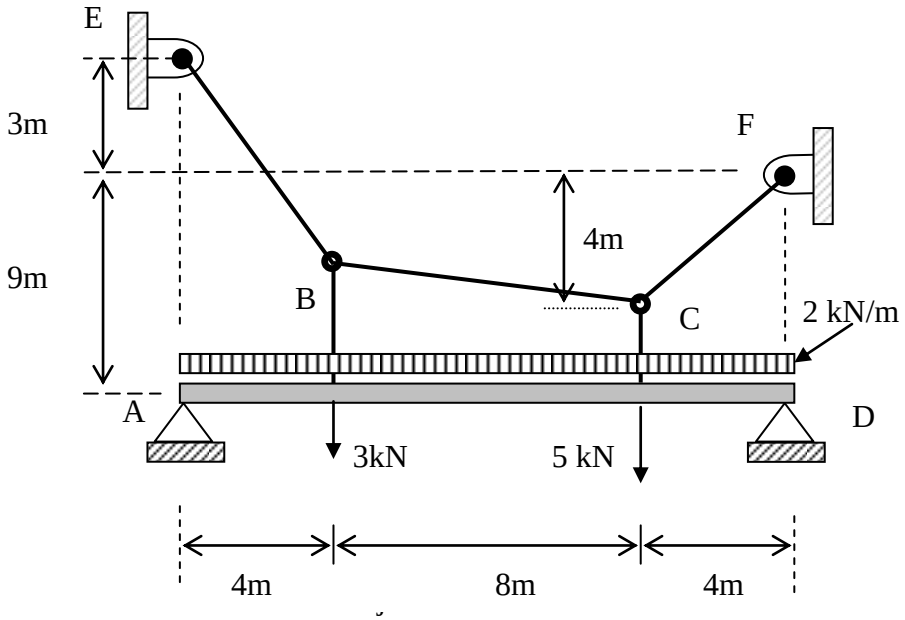

Figure 2

3. (a) The three pinned arch ADF shown in Figure 3 is designed to carry a uniformly distributed load of 1 kN/m spanning 20m on AC. Joint A, D and F are hinged.
Find: (i) reactions at A and F.
(ii) Bending moment at B, C and E . (10 marks)

(b) Sketch the bending moment diagram for span DF. (4 marks)

(c) What is the value of shear force and bending moment in the simply supported beam AD with 100m span, if the same loading was imposed on it?
(6 marks)

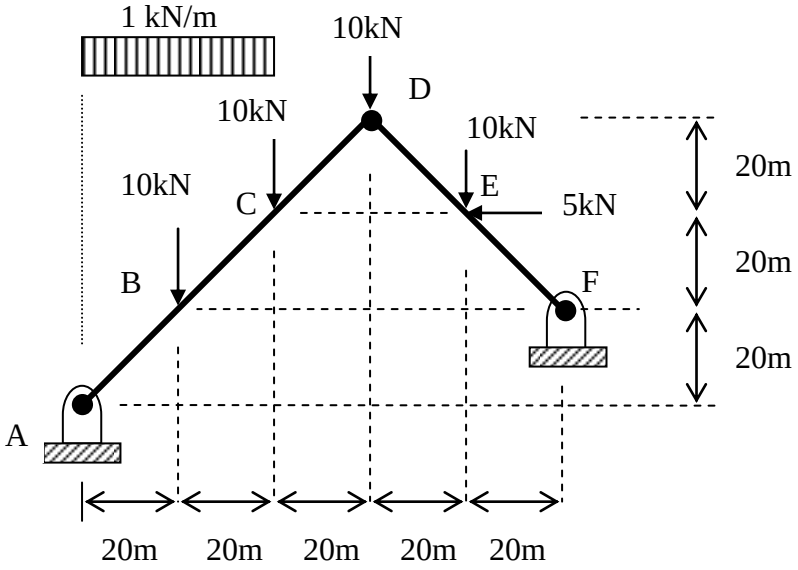

Figure 3

4. (a) A bridge deck ABCD is constructed to allow a moving truck travel on it as shown in Figure 4. The self weight of the deck is 1 kN/m. By using the method of influence lines, determine :
(i) The maximum reaction forces at B and D.
(ii) Maximum shear force at point C.
(iii) Maximum bending moment at point C. (12 marks)

(b) Determine the position of the maximum bending moment along the deck.
(8 marks)

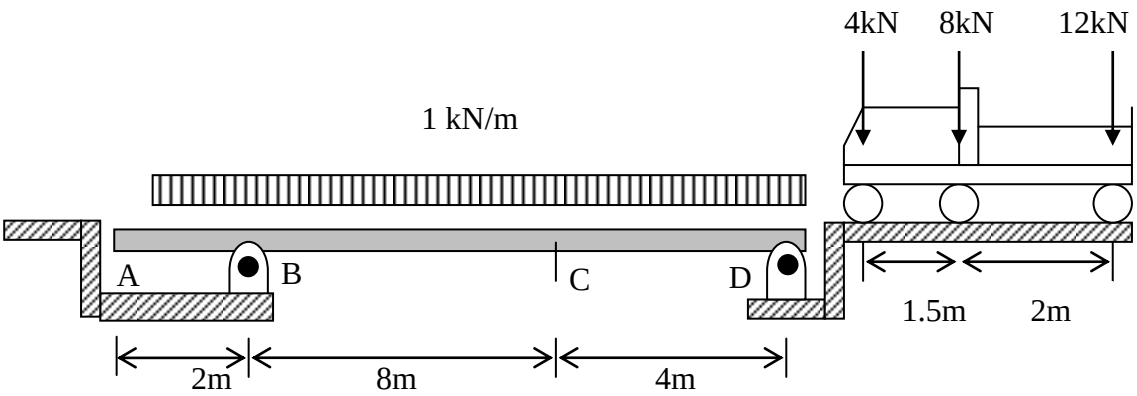

Figure 4

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SECTION B

5. Figure 5 shows a rigid frame, carrying a loading system as shown.

Calculate bending moment at each joints and also the maximum bending moment at each members span. Sketch the bending moment diagram and deflected shape of the frame, EI = constant. Use shape-displacement method.

Figure 5

(20 marks)

6. Using the Moment Distribution Method, determine the bending moment and shear force at critical sections for the continous beam as shown in Figure 6.

Sketch the bending moment and shear force diagrams.

Figure 6

(20 marks)

7. Calculate the bending moment at joints B, C and D for the Portal Frame shown in Figure 7, and hence sketch the bending moment diagram. Sketch also the deflected shape of the loaded frame.

Assume all members have the same size.

Figure 7

(20 marks)

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