Hall Ticket No | | | | | | | | | | | Question Paper Code: ACE008

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech V Semester End Examinations (Regular) - November, 2018

Regulation: IARE – R16

STRUCTURAL ANALYSIS

Time: 3 Hours **(CE)** **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) A truss of 16 m span is simply supported at A and H. Verify the support reactions at A (hinged) and H (roller) for the given loads as shown in Figure 1. Using method of sections determine the forces in members AC, BC and BD. **[7M]**

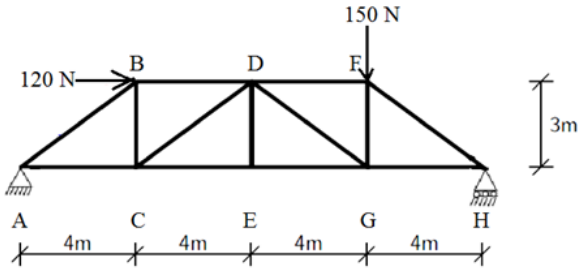

Figure 1

(b) Determine the force in each member of the pin-jointed plane truss shown in Figure 2 using method of joints. **[7M]**

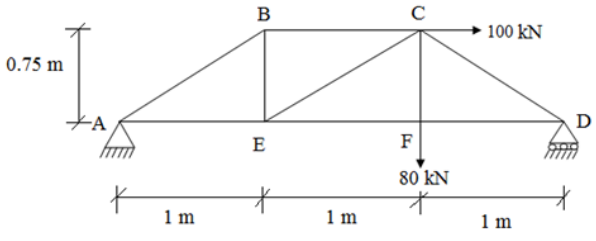

Figure 2

2. (a) Determine the force in each member of the pin-jointed plane truss shown in Figure 3 using method of tension coefficients. **[7M]**

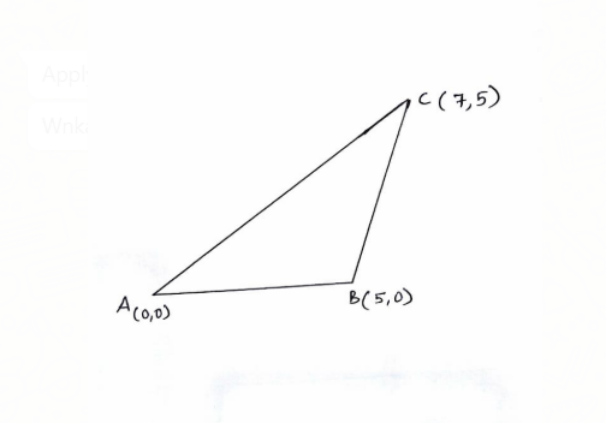

Figure 3

(b) Determine the member forces and their nature for the plane truss shown in Figure 4 using method of joints. **[7M]**

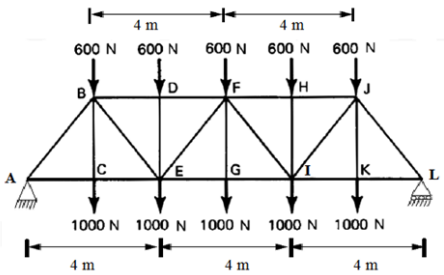

Figure 4

UNIT – II

3. (a) A three parabolic arch hinged at the springing and crown has a span of 20 m. The central rise of the arch is 4 m. It carries a point load of 4 kN at 4 m horizontally from the left hand hinge. Calculate the normal thrust and shear force at the section under the load. Also calculate the maximum positive and negative bending moments. **[7M]**

(b) A reinforced concrete arch is hinged between haunches 42 m apart. It has a central rise of 7 m and a parabolic profile. Find the increment in horizontal thrust in the arch for a temperature increase of 24°C. The section is 120 cm deep and 40 cm wide. E for concrete can be taken as 3 x 10^4MPa. Coefficient of thermal expansion for the arch material = 11.2 x 10^6 per °C. **[7M]**

4. (a) A two hinged parabolic arch, hinged at the ends has a span 60 m and a rise of 12 m. A concentrated load of 8 kN acts at 15 m from the left hinge. The second moment of area varies as the secant of the slope of the rib axis. Calculate the horizontal thrust and the reactions at the hinges. Also calculate the net bending moment at the section. **[7M]**

(b) A symmetrical three hinged circular arch has a span of 16 m and a rise to the central hinge of 4 m. It carries a vertical load of 16 kN at 4 m from the left end. Find the (i) magnitude of the thrust at the springing, (ii) reactions at the supports, (iii) bending moment at 6 m from the left hand hinge and (iv) the maximum positive and negative bending moment. **[7M]**

UNIT – III

5. (a) Analyse the propped cantilever shown in Fig.5and draw bending moment diagram. **[7M]**

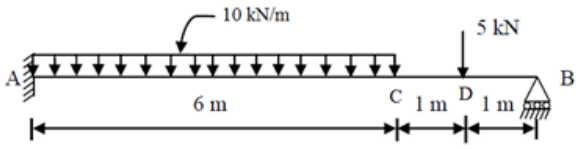

Figure 5

(b) Analyse the fixed beam shown in Figure 6 and draw bending moment diagram. **[7M]**

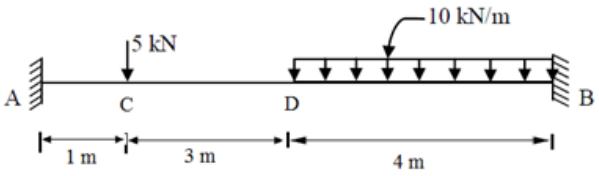

Figure 6

6. (a) Analyse the continuous beam ABCD shown in Figure 7 using Clapeyron's theorem of three moments. Drawshear force and bending moment diagrams. **[7M]**

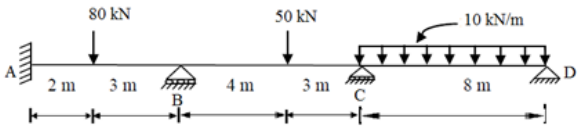

Figure 7

(b) Analyse the continuous beam ABCD shown in Figure 8 using Clapeyron's theorem of three moments. Draw shear force and bending moment diagrams, if support B sinks by 10 mm. Moment of inertia of the whole beam = 85 x 10^6 mm^4 and E = 2.1 x 10^5 N/mm^2. **[7M]**

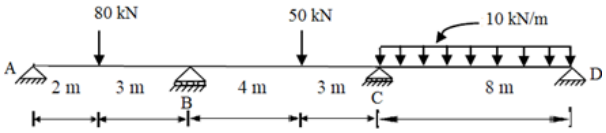

Figure 8

UNIT – IV

7. (a) Analyse the continuous beam ABCD shown in Fig.9 using slope deflection method and draw shear force, bending moment diagrams. Assume moment of inertia of the spans as $2I_{AB}= I_{BC} =2I_{CD}$. **[7M]**

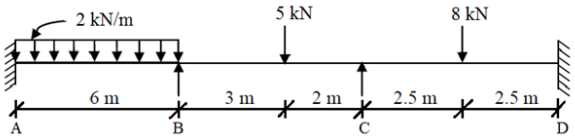

Figure 9

(b) Analyse the portal frame shown in Fig.10 using slope deflection method and draw the bending moment diagram and deflected shape of the frame. Take EI constant for all the members **[7M]**

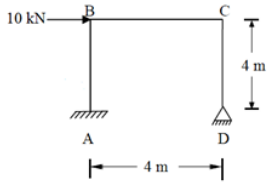

Figure 10

8. (a) Analyse the continuous beam ABCD shown in Figure 11 using moment distribution method and draw shear force, bending moment diagrams. Assume moment of inertia of the spans as $2I_{AB}= I_{BC} =2I_{CD}$. **[7M]**

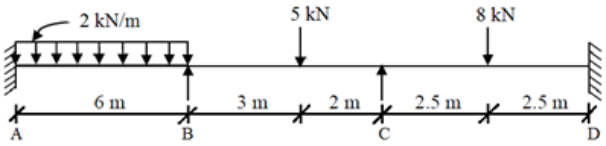

Figure 11

(b) Analyse the portal frame shown in Figure 12 using moment distribution method and draw the bending moment diagram and deflected shape of the frame. Take EI constant for all the members. **[7M]**

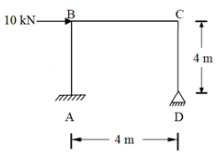

Figure 12

UNIT – V

9. (a) The following Table 1 system of wheel loads cross a span of 25 m. Find the maximum value of bending moment and shearing force in the span. **[7M]**

Table 1

Wheel load (in kN)	16	16	20	20	20
Distance between the loads (in m)	3	3	4	4	

(b) Two point loads of 4 kN and 6 kN spaced 6 m apart, crosses a a simply supported beam of 16 m span, the 4 kN load leading from left to right. Construct the maximum Shear Force and Bending Moment diagrams, stating the absolute maximum values. **[7M]**

10. (a) Two wheel loads of 16 and 18 kN, at a fixed distance apart of 2 m, cross a simply supported beam of 10 m span. Draw the influence line for bending moment and shear force for a point 4 m from the left abutment and find the maximum bending moment at that point. **[7M]**

(b) Draw a neat diagram of the influence lines for shear force and bending moment at a section 3 m from one end of a simply supported beam, 12 m long. Use the diagram to calculate the maximum shearforce and the maximum bending moment at this section due to a uniformly distributed rolling load of 2 kN/m on a 5 m long span. **[7M]**

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