INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Four Year B.Tech V Semester End Examinations(Regular) - November, 2019

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) Define perfect frame and imperfect frame. Explain the methods of analysis of frames in detail. **[7M]**

   (b) Find the forces in the member AB, BC and AC of the frame shown in Figure 1 by method of joints. **[7M]**
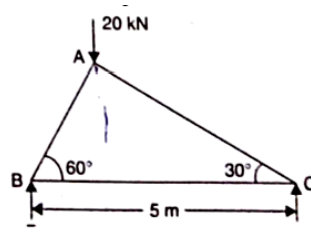

Figure 1

2. (a) Explain briefly about truss, different types of trusses with neat sketches. **[7M]**

   (b) Determine the forces in the truss shown in Figure 2 which carries a horizontal load of 12 kN and a vertical load of 18 kN. **[7M]**
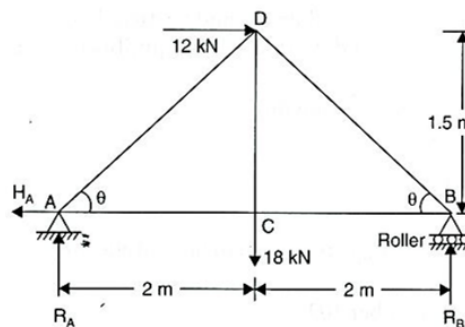

Figure 2

UNIT – II

3. (a) Write the expression for the horizontal thrust of a two-hinged arch under the effects of temperature, rib-shortening and support-yielding? Explain the effects of each on the horizontal thrust. **[7M]**

   (b) A 3 hinged arch of span 40m and rise 8m carries concentrated loads of 200 kN and 150 kN at a distance of 8m and 16m from the left end and an udl of 50 kN/m on the right half of the span. Find the horizontal thrust. **[7M]**

4. (a) Define the term arches. What are the applications of arches. Classify arches based on the number of hinges(support condition) with sketch **[7M]**

   (b) A symmetrical two hinged parabolic arch has a span of 50 m central rise 5m. It carries a concentrated vertical load of 20 kN at 10 m from left support in addition to a vertical load of 30kN at the crown. Draw the bending moment diagram for the arch and also determine the radial shear and normal thrust at 12.5 m from the left support. **[7M]**

UNIT – III

5. (a) What are the reaction values for propped cantilever beam when it carries uniformly distributed load. Draw Shear force diagram for a fixed beam carrying an eccentric load. **[7M]**

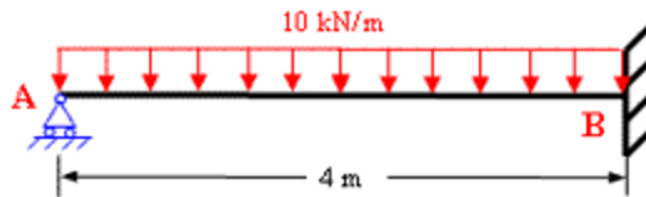   (b) Compute R_A and R_B. Sketch the SFD and BMD of the propped cantilever beam for Figure 3. **[7M]**

Figure 3

6. (a) Explain the term continuous beams. Write the expression for bending moment for continuous beam under udl. Draw bending moment diagram for a fixed beam carrying an eccentric load. **[7M]**

   (b) Find out the end moment by using theorem of three moment for Figure 4. **[7M]**
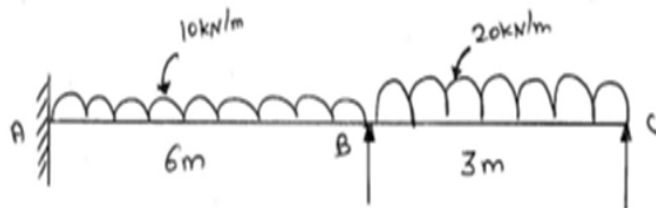

Figure 4

UNIT – IV

7. (a) What are the equilibrium equation for a space structure and for a continuous beam? Explain slope deflection to draw SFD and BMD. **[7M]**

   (b) A continuous beam ABC 24 m long is fixed at A, simply supported at B and C. The intermediate support B is at 12 m from A and sinks by 30 mm. The span AB carries a uniformly distributed load,of 3 kN/m and the span BC is subjected to a point load of 24 kN at 8 m from C. Analyze the beam by moment distribution method and draw the shearing force and bending moment diagrams. Take the flexural rigidity EI as 40,000 kNm2 and is constant throughout. **[7M]**

8. (a) Define i)Sway in a frame ii)Stiffness iii) Hinge iv)Joint v) Non sway

   [7M]

   (b) A portal frame ABCD is fixed at A and D, and has rigid joints at B and C. The column AB and CD are 3m long. The beam BC is 2m long, and is loaded with uniformly distributed load of intensity 6 kN/m. The moment of inertia is 2I and those of BC and CD is I. Plot bending moment diagram and sketch the deflected shape of the frame use slope deflection method. **[7M]**

UNIT – V

9. (a) What are the differences between shear or moment diagram and influence line diagram? **[7M]**

   (b) A uniform load of 30 kN/m, 5m long crosses a girder of 20m span. Calculate maximum shear force and bending moment at a section 8m from left support. Calculate absolute maximum bending moment and shear force in the girder. **[7M]**

10. (a) How is the maximum shear force and maximum bending moment determined in case of rolling loads? **[7M]**

    (b) A train of concentrated loads as given below move from left to right on a simply supported girder of span 16m, with the 40kN load leading

    Wheel load (KN): 20 60 80 40

    Spacing (m): 3 2 2

    Determine absolute maximum +ve and –ve shear force. **[7M]**