B. TECH
(SEMESTER-IV) THEORY EXAMINATION 2017-18
STRUCTURE ANALYSIS I

Time: 3 Hours   *Total Marks: 70*

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1.   **Attempt *all* questions in brief.**   **2 x 7 = 14**

   a) What do you mean by static and kinematic indeterminacy of a structure?
   b) Define space truss with suitable example.
   c) Draw the influence line diagram of bending moment for a simply supported beam at a section D.
   d) State the Eddy's theorem.
   e) Three hinged arch is a determinate structure. Why?
   f) Write statement of Castigliano's first and second theorem.
   g) What do you mean by principal axes?

SECTION B

2.   **Attempt any *three* of the following:**   **7 x 3 = 21**

   a) The loading and support condition of a plane truss is shown in fig. find the forces in member AB and AF.
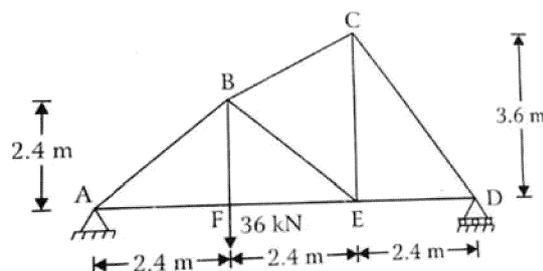

   b) A uniformly distributed load of 50 KN/m longer than the span rolls over a girder of 30 m span. Determine the maximum S.F. and B.M. at a section 12 m from left hand support.
   c)   A three hinged parabolic arch of span 40 m and rise 10 m carries concentrated loads of 20 KN and 70 KN at a distance 8 m and 16 m from the left and a uniformly distributed load of 50 KN/m on the right half of the span. Find the horizontal thrust.
   d) Determine the slop and deflection at free end of cantilever beam of span L, and uniformly loaded with load ' ω' . EI = constant
   e) A channel section has overall depth of 250 mm, flange width of 125mm, and flange thickness of 20 mm and also web thickness of 20 mm. find the location of shear centre.
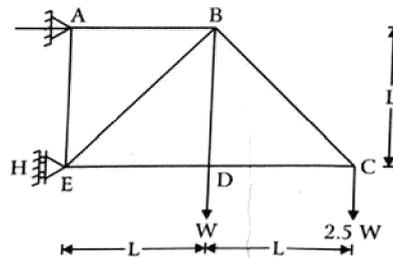
SECTION C

3. **Attempt any *one* part of the following:** 7 x 1 = 7

 a) Determine the static indetermineacy (D_s) and Kinematic indeterminacy (D_k) for a given frame.
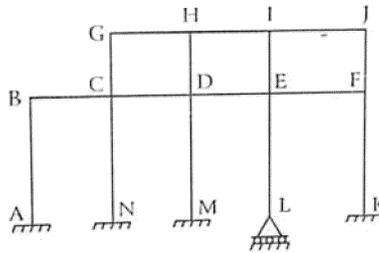
  b) A braced cantilever is loaded as shown in figure. All the members are of same cross sectional area. Find the force in BE.

4. **Attempt any *one* part of the following:** 7 x 1 = 7

  a) Two wheel loads 160 KN and 100 KN, spaced 4 m apart, are moving over a simply supported beam of 12m span. Determine the maximum shear force and maximum bending moment that may be developed anywhere on the beam.

  b) The load system shown in fig. moves from left to right on a girder of span 10 m. Find the absolute maximum bending moment for the girder.
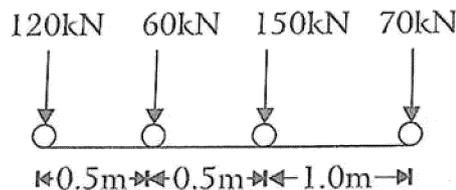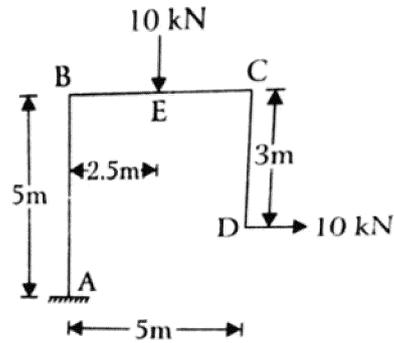

5. **Attempt any *one* part of the following:** 7 x 1 = 7

  a) Draw the influence line diagram for normal thrust of a three hinged parabolic arch at a section D.

  b) Proof that bending moment at any section of a three hinged parabolic arch having a UDL over its whole span will be zero

6. **Attempt any *one* part of the following:** 7 x 1 = 7

  a) A simply supported beam of uniform cross section subjected to concentrated load W at mid span. If span of the beam is 10 m, calculate slop at its end and also calculate the deflection at mid span. Use conjugate beam method.

b) Determine the horizontal deflection at a free end of the frame as shown in figure, by using unit load method.

7. **Attempt any *one* part of the following:** 7 x 1 = 7

a) A of beam of rectangular section 80 mm wide and 120 mm deep is subjected to a bending moment of 12 KN-m. the trace of the plane loading is inclined at 45^0 to the YY- axis of the section. Calculate the maximum bending stress induced in the beam.

b) A cast iron beam of T-section as shown in figure. The beam is simply supported on a span of 8 m. the beam carries a UDL of 1.5KN/m length on the entire span. Determine the maximum tensile and compressive stresses.
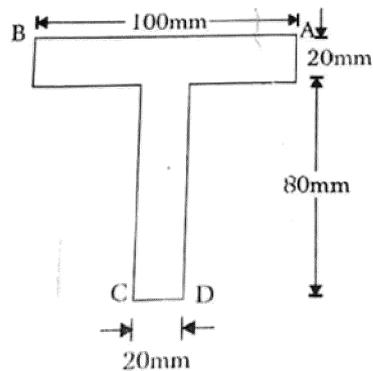
B TECH
(SEM IV) THEORY EXAMINATION 2017-18
STRUCTURAL ANALYSIS

Time: 3 Hours   *Total Marks: 70*

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1.   **Attempt *all* questions in brief.**   2 x 07 = 14

   a.   What do you mean by degree of redundancy?
   b.   Write statement of Castigliano's first theorem.
   c.   What is the effect of temperature change in the cable?
   d.   Write the name of the different types of joint and supports used in structures.
   e.   What are the objectives of structural analysis?
   f.   What are the uses of influence lines?
   g.   State the Muller - Breslau principle of influence line.

SECTION B

2.   **Attempt any *three* of the following:**   07 x 3 = 21

   a.   A cable of span 120 m and dip 10 carries a load of 6 KN/m on horizontal span. Find the maximum tension in the cable and the inclination of the cable at the support. Find also the forces transmitting to support the pier, if the cable passes over smooth pulley on the top of the pier. The anchor cable is at 60^0 to the vertical. Determine the maximum bending moment for the pier, if the height of the pier is 15 m.
   b.   Analyze the complex truss shown in figure while a load of 10 KN acts at the apex point D of the truss. Use method of substitution.
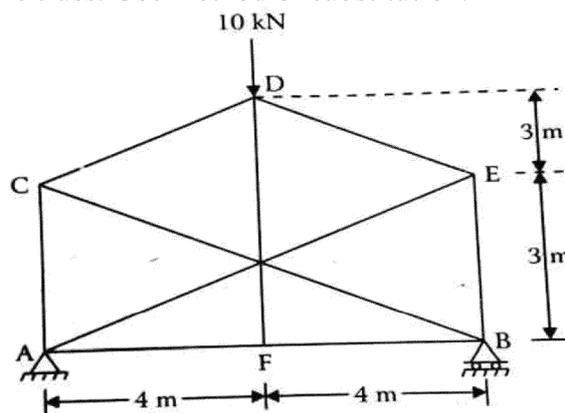

   c.   A simply supported beam of 16 m span is subjected to a uniform dead load of 5000 N/m and a uniformly live load (longer than span) of 8000 N/m. Determine
        i.   Maximum and minimum shear force at left hand quarter point
        ii.   Maximum bending moment at the same point
        iii.   The range over which shear force may have + ve and – ve values.
   d.   For the beam shown in figure find,
        i.   The deflection at E and B
        ii.   The slope at B and C.

Take I $= 8.30 \times 10^7$ mm^4 and E $= 200$ KN/mm^2.
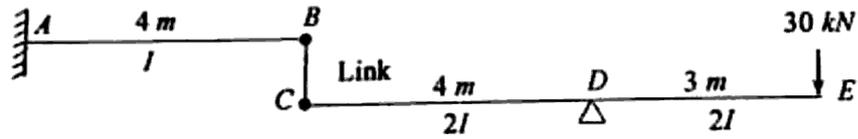
e. A circular segmental three hinged arch at the ends and at the crown has a span of 18 m and a rise of 4.50 m. The arch carries the loads as shown in figure. Find the reactions at the supports and the bending moments at the loaded points.
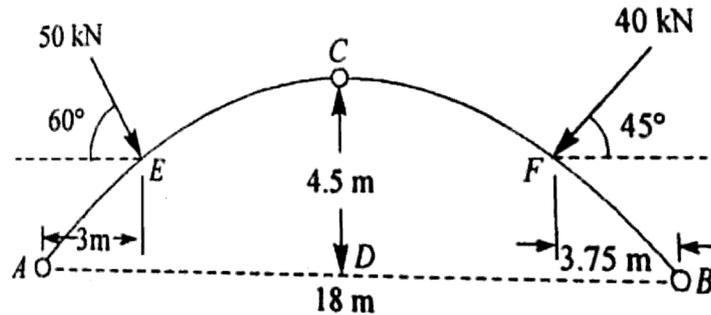

SECTION C

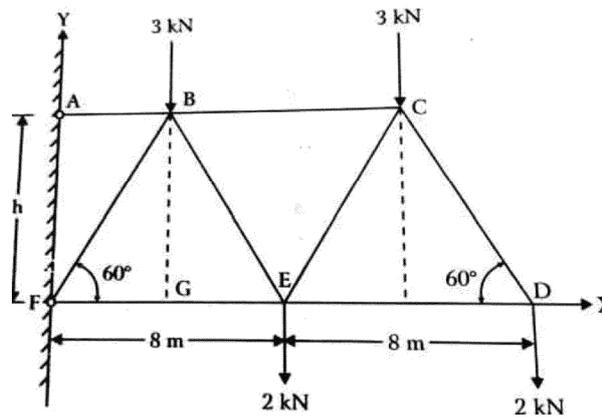3. **Attempt any *one* part of the following:**   07 x 1 = 07

(a)   i.   Explain briefly the classification of structures.
        ii. What is method of tension coefficient? Explain with suitable example.

(b)   A cable, 18 m long, is supported at two ends at the same level 16 m apart. The cable supports three loads of 8, 10 and 12 N dividing the 16 m distance in equal four parts. Find the shape of the string and tension in various portions.

4. **Attempt any *one* part of the following:**   07 x 1 = 07

(a)   All the members of the steel truss as shown in figure may be assumed pin jointed. Calculate forces in all the members. Area of cross section of all the members is same and equal to 30 cm^2.
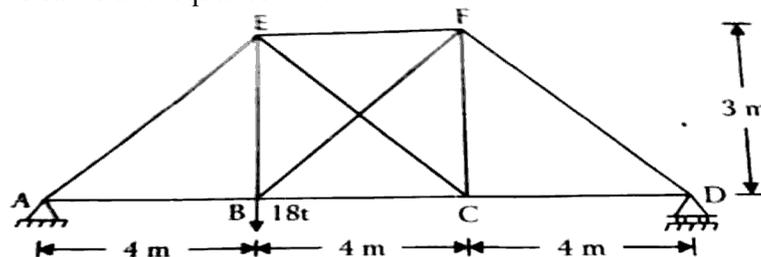
(b)   Analyze the truss shown in figure for the member forces using method of tension coefficients method.

5. **Attempt any *one* part of the following:** **07 x 1 = 07**

   (a) A simply supported beam of span L carries a concentrated load P at distances a and b from the two ends. Find the strain energy stored by the beam.

   (b) Determine the slope and deflection at the free end of a cantilever beam of span *l* subjected to a point load w at the free end, using unit load method. Take EI as constant.

6. **Attempt any *one* part of the following:** **07 x 1 = 07**

   (a) State and prove the propositions used for several point loads moving over a simply supported beam.

   (b) A uniformly distributed load of 20 KN/m intensity covering a length of 6 m moves over a simply supported beam of 15 m span. Determine the maximum positive shear force, maximum negative shear force and maximum bending moment at a section located at 5 m from the left support.

7. **Attempt any *one* part of the following:** **07 x 1 = 07**

   (a) A three hinged parabolic arch carrying a point loads of 20 KN and 30KN at a distance of 17 m and 13 m from the right support and a UDL of intensity 25 KN/m on the right half of the arch. It has a span 20 m and central dip of 5. Find resultants reactions, Bending moment, normal thrust and radial shear at a distance 15 m from right hinged and Maximum negative bending moment.

   (b) A three hinged parabolic arch ACB is hinged at the supports A and B which are below the crown hinge C by 3 m and 6.75 m respectively. The span of the arch is 22.5 m. The arch carries a UDL of 30 KN/m from A to C. Find the reactions at the supports and the maximum positive and negative bending moment.