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.
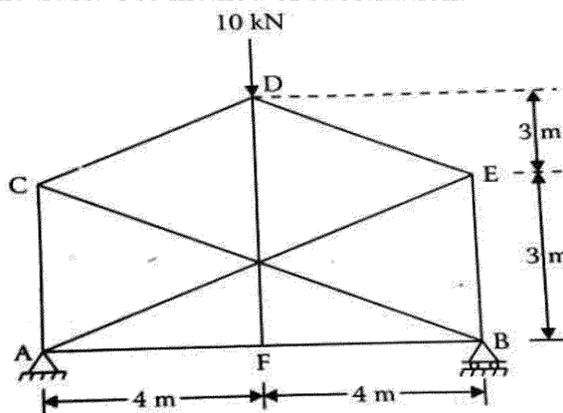

   c.   A simply supported beam of 16 m span is subjected to a uniform dead load of 5000 N/m and a uniformly live load (longer than span) of 8000 N/m. Determine
         i.   Maximum and minimum shear force at left hand quarter point
         ii.   Maximum bending moment at the same point
         iii.   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 x 10^7 mm^4 and E = 200 KN/mm^2.
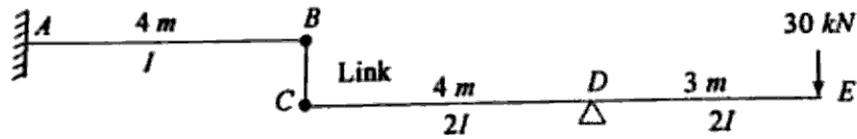
e.   A circular segmental three hinged arch at the ends and at the crown has a span of 18 m and a rise of 4.50 m. The arch carries the loads as shown in figure. Find the reactions at the supports and the bending moments at the loaded points.
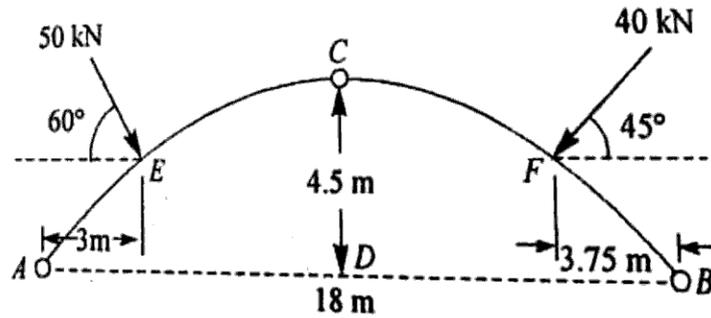

SECTION C

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.
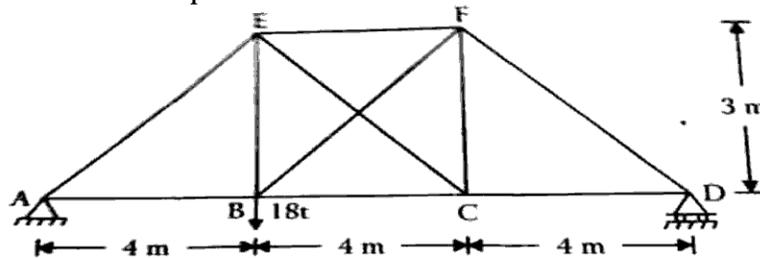
   (b)   Analyze the truss shown in figure for the member forces using method of tension coefficients method.
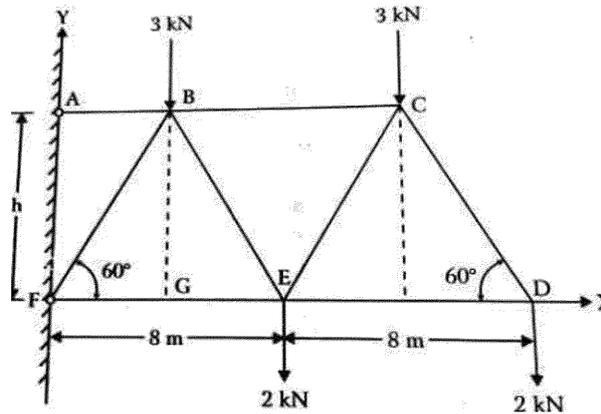
5. **Attempt any *one* part of the following:**   **07 x 1 = 07**

   (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.