Printed Pages:3 **Sub Code: NCE 401**

Paper Id: **100247** **Roll No.** | | | | | | | | | | |

B TECH
(SEM IV) THEORY EXAMINATION 2018-19
STRUCTURAL ANALYSIS - I

Time: 3 Hours ***Total Marks: 100***

Note: Attempt all Sections. If you require any missing data, choose suitably.

SECTION A

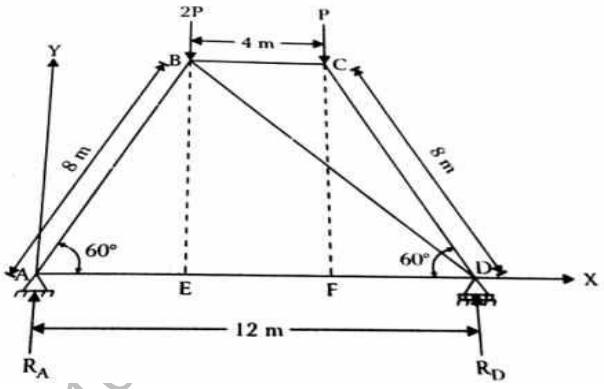
1. Attempt *all* questions in brief. **2 x 10 = 20**

a. Define space truss with suitable sketches.
b. What do you mean by degree of indeterminacy?
c. What are the uses of influence lines?
d. Define the term opposite joint.
e. Explain normal thrust and radial shear at any section of the arch.
f. What do you mean by span and rise of the arch?
g. Write statement of first and second theorem for conjugate beam method.
h. Define neutral axis
i. When the shear centre is coincides with the centroid?
j. Differentiate between straight and curved beam.

SECTION B

2. Attempt any *three* of the following: **10 x 3 = 30**

a. A truss shown in figure loaded with two point loads of 2P and P KN at joints B and C .Determine forces in all the members by using the method of tension coefficient.



b. Four point loads 8, 15, 15 and 10 KN have centre to centre spacing of 2 m between consecutive loads and they traverse a girder of 30 m span from left to right with 10 KN load leading. Calculate the maximum bending moment and shear force at 8 m from the left support.

c. 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.

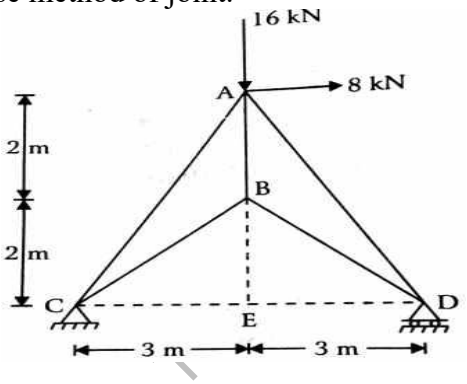
d. A simply supported beam of span 8 m is subjected to a point load of 150 kN at 5 m from left support. Using the conjugate beam method, determine the slope at the supports and deflection under the load. Take EI as constant.

e. A rectangular simply supported beam having section as 150 mm × 200 mm has a span of 8 m. The beam is subjected to two point loads of 25 kN each at 2 m and 6 m from left support. The plane of loads makes an angle of 30° with the vertical plane of symmetry. Determine the direction of neutral axis and the bending stresses at all the corners of the section at mid span of the beam.

SECTION C

3. Attempt any *one* part of the following: 10 x 1 = 10

(a) Determine the forces and their nature in all the members of the pin jointed truss as shown in figure. Use method of joint.



(b) Distinguish between a deficient and a redundant truss. Explain with suitable example.

4. Attempt any *one* part of the following: 10 x 1 = 10

(a) Prove that " when a system of a point loads crosses a beam, simply supported at the ends, the maximum bending moment under any given wheel load occurs when this wheel load and the centre of gravity of the total wheel system are equidistance from the end of the beam"

(b) Discuss Muller Breslau's Principles and its application in structural analysis.

5. Attempt any *one* part of the following: 10 x 1 = 10

(a) A three hinged parabolic arch of span 'l' has its abutments at depths h_1 and h_2 below the crown. The arch carries a UDL of 'w' KN/m over the whole span. Determine the horizontal thrust at each support.

(b) A three hinged parabolic arch of span 20 m and a rise of 5 m is subjected to a triangular loading of intensity varying from 15 kN/m at abutments to zero at the crown. Find the resultant reaction at supports. Also determine the maximum value of the bending moment. Draw bending moment diagram.

6. Attempt any *one* part of the following: 10 x 1 = 10

(a) A beam AB is simply supported over a span 5 m in length. A concentrated load of 30 kN is acting at a section 1.25 m from support A. Calculate the deflection under the load point. Take E = 200 x 10^6 kN/m^2 and I = 13.0 x 10^{-6} m^4, using

Maxwell's reciprocal theorem.

(b) State and prove Castigliano's theorem.

7. Attempt any *one* part of the following: 10 x 1 = 10

(a) What do you mean by bending of curved bars? Derive the relevant expressions for the bending of curved bars with small initial curvature.

(b) A channel section has overall depth of 250 mm, flange width of 125 mm, flange thickness of 20 mm and also web thickness of 20 mm. Find the approximate location of shear centre.