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Total No. of Questions: [09]

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B. Tech. Civil Engg. (Semester – 6th)
STRUCTURAL ANALYSIS-II
Subject Code: BCIES1-602
Paper ID: [18110740]

Time: 03 Hours **Maximum Marks: 60**

Instruction for candidates:

1. Section A is compulsory. It consists of 10 parts of two marks each.
2. Section B consist of 5 questions of 5 marks each. The student has to attempt any 4 questions out of it.
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

Section – A **(2 marks each)**

Q1. Attempt the following:

- a) Illustrate a statically indeterminate structure with the help of examples.
- b) Mention the advantages and disadvantages of continuous beams.
- c) Illustrate kinematically determinate and kinematically indeterminate structures.
- d) State the method of consistent deformations.
- e) State the theorem of minimum strain energy.
- f) What is the major difference between a beam and a portal frame?
- g) What does the stiffness of a member indicate?
- h) What is the purpose for approximate analysis of building frames?
- i) In what way an influence line for a statically indeterminate structure differs from that of a statically determinate one?
- j) How will you find horizontal thrust in a two hinged arch?

Section – B **(5 marks each)**

Q2. A cantilever is propped on its free end by a spring of stiffness 2 kN/mm. If $E = 200$ GPa and I for the cross section is 10×106 mm 4 , find the reaction at the spring and draw the SF and BM diagrams for the beam if it is loaded with a UDL of intensity 20 kN/m over the whole span.

Q3. A fixed beam of span 4 m has a cross section with a moment of inertia of 8000 cm 4 and $E = 2 \times 108$ kN/m 2 . If the support at the left settles by 15 mm and that on the right settles by 6 mm, calculate the fixed end moments. Also draw the bending moment diagrams and sketch the deflected shape.

Q4. A beam ABC has a fixed support at A and roller supports at B and C. AB = 4 m and BC = 3 m. There is a uniformly distributed load of 20 kN/m on AB and a point load of 40 kN at the centre of BC. Draw the SF and BM diagrams for the beam.

Q5. Analyze the portal frame ABCD which is fixed at A and D and has rigid joints at B and C. There is a UDL of 6 kN/m on BC. AB = DC = 2m and BC = 4 m. EI is constant for all members. Draw the bending moment diagram and sketch the deflected shape of the structure. Use Moment Distribution Method of structural analysis.

Q6. Compare Portal and Cantilever methods of approximate analysis of building frames.

Section – C (10 marks each)

Q7. Derive the general three-moment equation with support settlements and explain the terms used in the equation with illustrative sketches.

Q8. A two hinged parabolic arch of span L and rise L/4 is subjected to a concentrated load W at its quarter span. Show that the value of the horizontal thrust at the ends is $285 W/512$. Take $I = I_0 \sec \theta$.

Q9. A propped cantilever AB of length 6 m is propped at B.

a. Determine the equation for the influence line for reaction at B.

b. Draw the influence line diagram for SF at a section C which is at 4m from A