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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 10×10^6 mm⁴, 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 cm⁴ and $E = 2 \times 10^8$ kN/m². 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. $AB = DC = 2\text{m}$ and $BC = 4\text{m}$. 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