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Total Number of Pages: 02

Course: B.Tech
Sub_Code: RCI4C003

4th Semester Back Examination: 2024-25

SUBJECT: Structural Analysis-I

BRANCH(S): CIVIL ENGG.

Time: 3 Hours

Max Marks: 100

Q.Code: S373

Answer Question No.1 (Part-I) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part-I

Q1 Answer the following questions: (2 x 10)

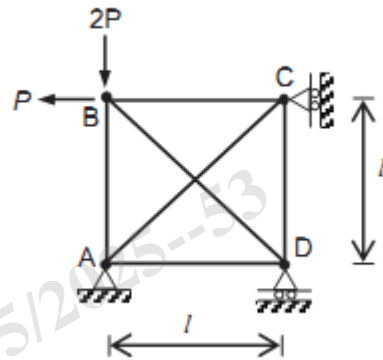
- Define the term "static indeterminacy".
- State the principle of minimum potential energy.
- Define the term "conjugate beam"
- Define the term "maximum bending moment envelope".
- Draw neat sketch of a three hinged semi-circular arch.
- Write the advantages of fixed beam over simply supported beams.
- State Moment-Area theorems.
- Define the term "Virtual work".
- State Equilibrium equations for a three-dimensional structure.
- Name the components of a three hinged stiffening girders.

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- Differentiate between determinate and indeterminate structures with examples.
- Distinguish between force and displacement methods with examples.
- State and explain Castigliano's theorem with an example.
- Write short note on Williot –Mohr diagram.
- Explain the terms normal thrust and radial shear for three hinged arches with neat sketches.
- Using strain energy method to determine the deflection of the free end of a cantilever of length "L" subjected to a concentrated load "P" at free end.
- A simply supported beam (AB) has a span of 15 m. A uniformly distributed load of intensity 50 kN/m and having length 5 m crosses the beam from left to right. Determine maximum shear force at a section 7 m from left end (A) using influence line diagram.
- Write short note on space trusses.

- i) A three hinged parabolic arch having span length of 24 m and a central rise of 4 m. It carries a concentrated load of 50 kN at a distance of 18 m from left end and a uniformly distributed load of 30 kN/m over left half portion of the arch. Determine the horizontal thrust for this arch.
- j) A fixed beam (AB) of 7 m span is carrying two concentrated loads. The first one is 10 kN, acting 2 m from left end (A) and the other is 20 kN, acting at 4 m away from right end (B). Determine the support moments.
- k) A simply supported girder has a span of 15 m. A 300 kN wheel load moves from one end to the other end on the span of girder. Find maximum bending moment which can occur at a section 4 m from the left end.
- l) Find the forces developed in the members of the truss shown in Figure. AE is constant for all the members. Where A is the area of cross-section and E = Young's modulus of elasticity. The length members are also identical.



Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

(16 x 2)

- Q3** Draw the influence line diagram for reaction, shear force, and bending moment of a simple supported beam (AB) of span 10 m. (16)
- Q4** A cantilever beam ABC is fixed at A and propped at C. The portion AB of length 5 m from the fixed end and is loaded with uniformly distributed load of intensity 20 kN/m. the portion BC is of length 3 m is unloaded. Calculate the reaction at prop and draw shear force and bending moment diagram using consistent deformation method. (16)
- Q5** Determine the end moments and draw shear force and bending moment diagram of a simply supported continuous beam ABC having span length lengths $AB = 8$ m and $BC = 10$ m. The span AB carries a point load of 30 kN at a distance of 3m from support A and span BC carries a uniformly distributed load of intensity 20 kN/m throughout the span (BC). Use three moment theorem. All supports are simply supported. (16)
- Q6** A three hinged symmetric parabolic arch having span 50 m and central rise 12 m. It carries a concentrated load of 60 kN at distance 15 m from right support and a uniformly distributed load of intensity 30 kN/m over left half portion of the arch. Determine the normal thrust and radial shear at a section 20 m from left end. Draw the bending moment diagram. (16)