QUESTION BANK (Academic Year 2018-19)
STRUCTURAL ANALYSIS - I
II Year B-TECH– II Semester Branch: Civil Engineering Regulation: R-16

UNIT-I

1.a. What do you understand by the term prop?----------2M

b. Derive an expression for the prop reaction in a cantilever carrying a u.d.l over the entire span and propped at the free end----------8M

2. Draw the bending moment and shear force diagram of a propped cantilever beam of span 6m due to a point load of 6 kN at the mid span----------10M

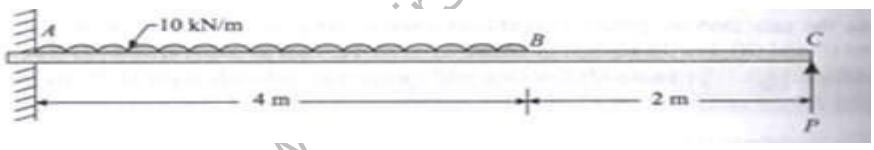
3. a. Define sinking of prop. How does it differ from a rigid prop?----------2M

b. A cantilever of length l carries a point load W at its free end. It is popped at a distance of l/4 from the free end. Find out the prop reaction----------8M

4.a Differentiate between cantilever and propped cantilever----------2M

b. A cantilever of length 'L' carries a concentrated load 'W' at its mid-span. If the free end is supported by a prop, find the reaction at the prop and also draw the S.F. and B.M. diagrams----------8M

5. A cantilever ABC is fixed at A and propped at C is loaded as shown in the figure. Find the reaction at C----------10M



6. A propped cantilever beam AB of span 8m is carrying a U.D.L of 4kN/m for a length of 6m from the left end and point load of 10kN at 2m from the right end. Calculate the prop Reaction and also draw the BM & SF diagrams----------10M

7. A cantilever of length 6m carries a u.d.l of 2 KN/m over a length of 4m starting from the fixed end. The cantilever is propped rigidly at the free end. If the value of E=2x105 N/mm2 and I=108 mm4 then determine: a) Reaction at the rigid drop, b) The deflection at the centre of the cantilever and c) Magnitude and position of maximum deflection----------10M

UNIT-II

1.a. Find the moment at the left hand support, if a fixed beam of span 'L' is sunk by an amount 'Δ' at the right hand support----------3M

b. A fixed beam of span 6 m is subjected a UDL of 5 kN/m on the left half of the span and a point load of 15 kN at the middle of the right half of the span. Draw the S.F. and B.M. diagrams.7M

2.a. A fixed beam of span 6 m is subjected a UDL of 5 kN/m over the entire span. Find the net moment at the center of span----------3M

b. A fixed beam of span 8 m is subjected to a linearly varying load of 8 kN/m from one support to 6kN/m to the other support. Find the support reactions and moments. Draw the shear force and bending moment diagrams----------7M

3. a. A fixed beam of span 6 m is subjected to a point load of 5 kN at the one-third of span from the left end. Find the moments at the supports----------2M

b. A fixed beam of 6 m span carries a uniformly distributed load of 12 kN/m run over the whole span. The level of right hand support sinks by 8 mm below that the left hand end. Take E=2.10x108kN/m2 and I=4.50x10-5 m4. Find (i) Support moments, (ii) Support reactions, and (iii) Deflection at the centre.----------8M

4. A fixed beam AB of length 8m carrying a U.D.L of 20kN/m on whole span with a point load of 40kN on centre of the span, analyze the beam and draw the SF and BM diagram-------10M

5.a. If a fixed beam AB carries an eccentric load P, what is the value of maximum deflection?--2M

b. A fixed beam AB of span 6m is subjected to two point loads of 20kN and 15kN at a distance of 2m and 4m from A. Calculate the fixing moments at A and B----------8M

6. a. Draw the bending moment diagram for eccentrically point loaded on fixed beam--------2M

b. A fixed beam AB of span 6m is carrying a uniformly distributed load of 4kN/m over the left half span. Find the fixing moments and support reactions.----------8M

7.a. What are the advantages of fixed beams?----------2M

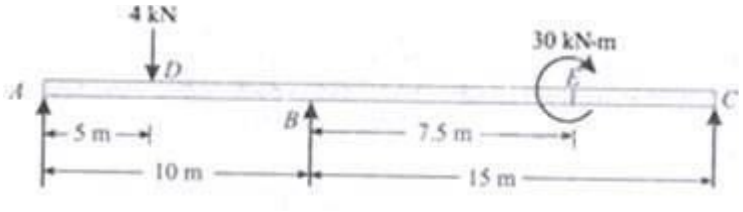
b. A fixed beam AB of 3m span is subjected to a point load of 15kN at a distance of span. Find the fixing moments and deflection of the beam under the load. Take EI = 2 x 103kN-m2-------8M

UNIT-III

1.a. State Claypeyron's Three Moment theorem----------2M

b. Derive the theorem of three moments----------8M

2.A continuous beam ABC of constant moment of inertia is simply supported at A .The beam carries a central point load of 4kN and clockwise central couple of moment 30kN-m in span BC as shown in the figure----------10M

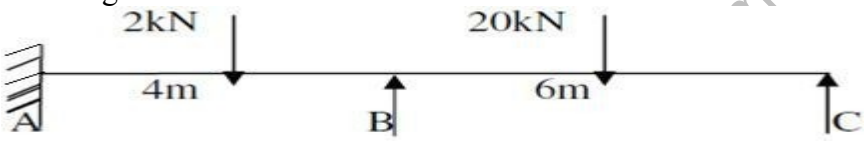


3.a What is a continuous beam? Explain with figure----------2M

b. How can you apply the theorem of three moments for a fixed beam?Discuss with example 8M

4. A continuous beam ABC consists of spans AB and BC of lengths 4m and 6m respectively, the ends A and B being fixed. C is a free end. The span AB carries a uniformly distributed load of 24 kN/m while the span BC carries a point load of 108 kN at a distance of 2m from C. Find the support moments and support reactions----------10M

5. Analyze the continuous beam shown in below Figure. Use three-moment equation. Draw S.F and B.M diagrams----------10M



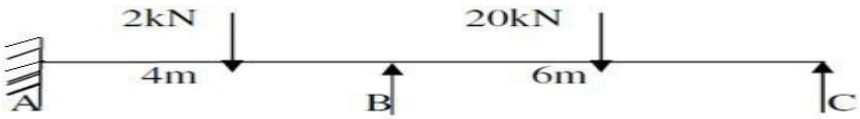
6. Four point loads 100, 120, 150 and 80 KN spaced equally 2 m apart crosses a girder of 25 m span from left to right with 100 KN load leading. Calculate the maximum BM at a section 5 m from the left hand support and absolute max BM----------10M

7. A continuous beam ABC consists of two spans AB of length 4m, and BC of length 3m. The span AB carries a point load of 100 KN at its middle points. The span BC carries a point load of 120 KN at 1m from C. The end A is fixed and the end C is simply supported. Find The moments at the supports, The reactions at the supports and Draw the B.M diagram by using Clapeyron's theorem of three moments----------10M

8. Analyze the continuous beam ABCD whose having AB length is 4m which is a carrying a point load 15kN at centre, with BC of span 6m and carrying a UDL of 4kN/m, with CD of span 4m carrying a 6kN/m with moment of inertias 3I, 4I and 3I, using three-moment equation. Draw S.F and B.M diagrams----------10M

UNIT-IV

1.a. Write the expression MAB in terms of fixed moments, slopes θA, θB and settlement Δ.---2M
b. Analyze the continuous beam shown in below Figure. by Slope-Deflection method and draw bending moment diagram----------8M



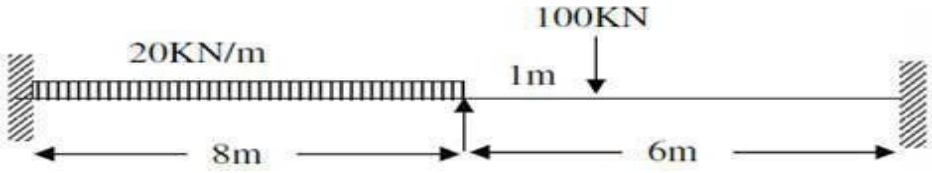
2. a. Write the formula for slope for a cantilever beam with point load at end----------2M
b. A continuous beam ABC consists of spans AB and BC of lengths 4m and 6m respectively, the ends A and B being fixed. C is a free end. The span AB carries a uniformly distributed load of 24 kN/m while the span BC carries a point load of 108 kN at a distance of 2m from C. Find the support moments and support reactions----------8M

3. A simply supported beam ABC is continuous over two pans AB and BC of 8m and 6m respectively. The span AB is carrying a uniformly distributed load of 20kN/m and span BC is carrying a point load of 60kN at a distance of 2m from B. Find the support moment at B. Also draw the bending moment diagram. Use slope deflection method. ---------- 10M

4. a. Explain the terms Static Indeterminacy, Kinematic Indeterminacy and Degree if Indeterminacy.
b. A continuous beam is built in at A and it is carried over rollers at B and C with spans of AB and BC being 10m. The beam carries a uniformly distributed load of 7.5KN/m over AB and a point load of50KN over BC 2.5m from the support B, which sinks by 20mm. Values of E and I are 2 * 105N/mm2 and 2 *109mm4. Calculate the support moments and draw bending moment diagram giving critical values. Use Slope deflection method. ---------- --8M

5. A Continuous beam is fixed at A and is supported over rollers at B and C. AB=BC=12M.The beam carries a uniformly distributed load of 30kN/m over AB and a point load of 240kN at a distance of 4M from B on span BC.B has an settlement of 30mm.E= 2 x105 N/mm2, I=2x10^{9}mm4. Analyse the beam by slope deflection method. ---------- -------10M

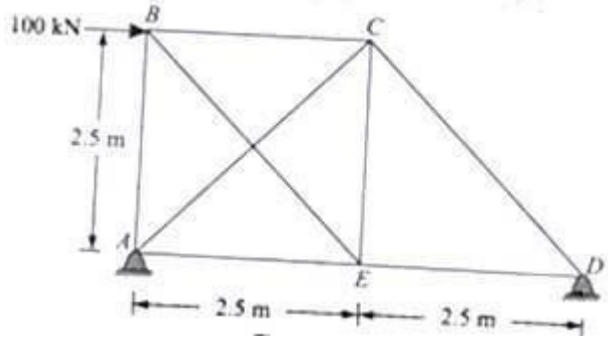
6.a. Give two examples each of Statically Indeterminate and Kinematic Indeterminate structures. Calculate degree of indeterminacy in each of the cases----------2M
b. Evaluate the bending moment and shear force diagrams of beam in below figure by slope deflection method----------8M



7. a. Write the expression MAB in terms of fixed moments, slopes θA, θB and settlement Δ.- 2M
b. A continuous beam ABC is fixed at A and simply supported at B and C. The span AB is 6m and carries a uniformly distributed load of 10 kN/m. The span BC is 4m and carries uniformly distributed load of 30 kN/m. Determine the fixed end moments by Slope Deflection method. -8M

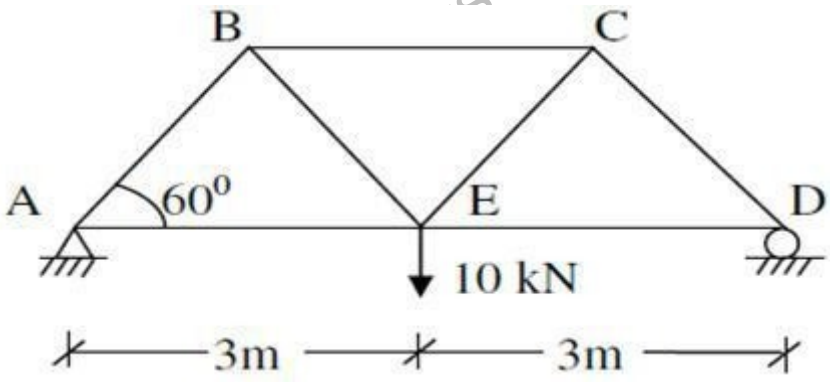
UNIT-V

1. a. Derive the expression of strain energy due to axial loading----------2M
b. Determine the forces in the members AC and BE of a pin jointed truss shown n the figure. Assume cross sectional area of each member to be 15 x 10-4 m^2.



2. a. Draw bending moment diagram for simply supported beam with point load at centre 2M
b. Define Strain energy. Derive an expression for strain energy due to bending moment 8M

3. a. Write the expression of strain energy due to axial load?----------2M
b. Determine the vertical deflection of Joint 'C' for the truss shown in below Figure. Take A=500x10-6m2, E=200x106kN/m2 are constant for all members. Use strain energy method.



4. a. Derive the expression for strain energy of a straight prismatic bar of length L and crosssectional area A, if it is subjected to a bending M----------3M
b. Discuss the Maxwell's theorem for redundant frames----------7M

5.a State Castigliano's first theorem----------2M
b. Derive Castigliano's first theorem with an example----------8M

UNIT-VI

1.a Define the term opposite joint. What important rule does it play in drawing the influence line diagram?----------2M

b. Describe the procedure for drawing the influence lines for the forces in the vertical and diagonal members of a truss? How does it differ from the bottom chord horizontal members?-8M

2. a. What do you understand by the word rolling loads?----------2M

b. State the position of a uniformly distributed load for a maximum bending moment and shear force when it crosses girder of smaller than that of load----------8M

3. a. Define influence line----------2M

b. A girder of span 16m is subjected to a dead load of 30kN/m .Calculate the portion of the girder for which shear force changes sign, when an equivalent distributed load of 60 kN/m crosses the girder----------8M

4. Draw the influence line diagram for B.M at a point 8m from the left abutment on a bridge girder of span 30m and find the maximum B.M at that point due to a series of wheel loads 80kN, 160kN, 160kN and 160kN at centre to centre distances of 4m, 2.5m, 2.5m and 2.5m respectively. The loads can cross in either directions with the 80kN load leading----------10M

5. a. What is the condition for absolute maximum bending moment due to moving UDL longer than the span?----------2M

b. A uniformly distributed load of 25kN/m and 20m long crosses a girder of span 12m. Calculate the Maximum Shear force and Bending Moment at 0m, 3m, 6m, 9m from the left end support and construct Diagrams ---------- 8M

6. a. Construct influence line for a shear at a section x of a simple beam of span L--------2M

b. Four point loads 100, 120, 150 and 80 KN spaced equally 2 m apart crosses a girder of 25 m span from left to right with 100 KN load leading. Calculate the maximum BM at a section 5 m from the left hand support and absolute max BM----------8M

7. a. Determine the bending moment at a section 1.5 m in a simple beam of span 4 m, when a point load of 15 kN rolls across the beam----------2M

b. Two wheel loads of 16 and 8 kN at a fixed distance of 2 m, cross a beam of 10 m span. Draw the Influence Line for B.M and S.F for a point 4 m from left support, and find the max. B.M and S.F at that point----------8M

8. a. Determine the maximum positive shear force at a section 1.5 m in a simple beam of span 4m, when a point load of 15 kN rolls across the beam----------2M

b. Two point loads of 8 kN and 4 kN spaced 3 m apart cross a girder of 15 m span, the smaller load leading from left to right. Construct the maximum S.F. and B.M. diagrams, stating the positive and amount of absolute maximum bending moment----------