

**III B. Tech I Semester Supplementary Examinations, February-2022**  
**STRUCTURAL ANALYSIS – II**  
 (Civil Engineering)

Time: 3 hours

Max. Marks: 70

- Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)  
 2. Answering the question in **Part-A** is compulsory  
 3. Answer any **THREE** Questions from **Part-B**  
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**PART -A****(22 Marks)**

1. a) Mention the process of analyzing the fixed arches. [3M]
- b) Explain how lateral loads are developed on a structural frame? [4M]
- c) What is the effect of temperature on the cables? [4M]
- d) Write the equations for continuous beam with and without sway. [4M]
- e) What are advantages and limitations of Kani's method? [4M]
- f) What are the characteristics of flexibility method? [3M]

**PART -B****(48 Marks)**

2. a) State and prove Eddy's theorem. [8M]
- b) A three hinged segmental arch of horizontal span 40m and central rise 8m is hinged at the springing and crown. It carries a u.d.l of 20kN/m over the left half of the span together with a point load of 100kN at 10m from right support. Find the Support reactions and ( $R_A$ ,  $R_B$ , H). Normal thrust and radial shear at 10m from the left support. [8M]
3. a) Explain analysis of a frame subjected to lateral load by adopting portal method. [8M]
- b) Analyze the two storey rigid moment resisting frame shown in Figure-1 by Cantilever method. Draw the BMD and SFD. Assume uniform flexural rigidity of beams and columns. [8M]

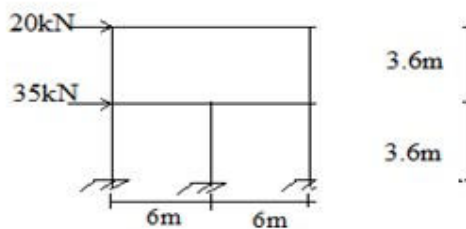


Figure-1

4. a) What is a general cable theorem? Deduce an expression. [8M]
- b) A cable is used to support six equal and equidistant loads over span of 14 m. The central dip of cable is 2 m and loads are 25 kN each. Find the length of the cable required and its sectional area if the safe tensile stress is 140 N/mm<sup>2</sup>. [8M]

5. a) Analyze two span continuous beam for only support moments as shown in Figure-2 below by using the Moment Distribution Method. [8M]

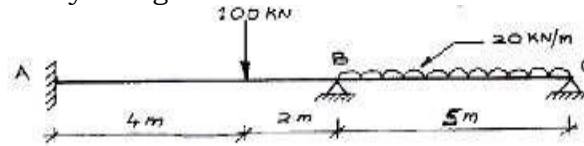


Figure-2

- b) Analyze the portal frame as shown in Figure-3 by moment distribution method and draw Bending moment diagram. (Assume  $E=2 \times 10^5$  MPa and  $I=6 \times 10^6$  mm<sup>4</sup>) [8M]

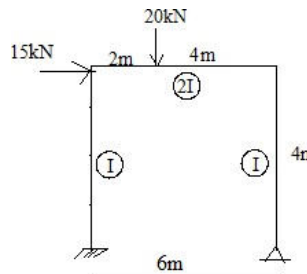


Figure-3

6. a) Write the steps for analyzing a portal frame carrying a udl by Kani's method. [8M]  
 b) Analyze the continuous beam shown in Figure-4 by Kani's method. [8M]  
 Assume  $E = 2 \times 10^5$  MPa and  $I=10^8$  mm<sup>4</sup>

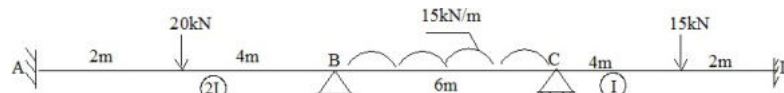


Figure-4

7. a) Write the steps involved in analyzing the flexibility matrix method. [8M]  
 b) Analyze the continuous beam shown in Figure-5 using the stiffness method. Draw BMD. Given  $AB=BC=10$ m. [8M]

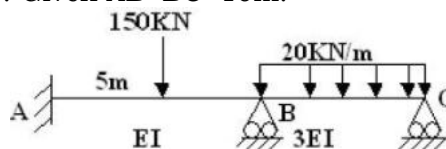


Figure-5

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## III B. Tech I Semester Supplementary Examinations, May-2018

## STRUCTURAL ANALYSIS – II

(Civil Engineering)

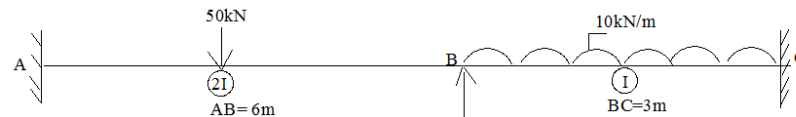
Time: 3 hours

Max. Marks: 70

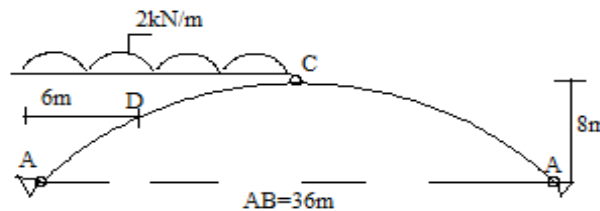
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**PART -A**

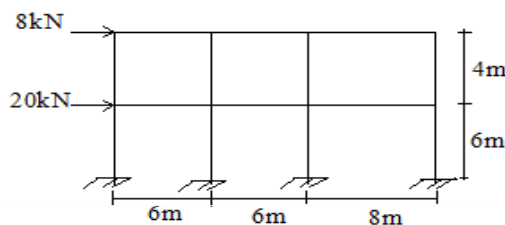
- 1 a) State Eddy's theorem. [3M]
- b) Write the basic assumptions of analysis in Cantilever method when lateral loads applied on the structure. [4M]
- c) Write an expression to find maximum tension, horizontal and vertical reactions of three hinged stiffened girder in suspension bridge. [4M]
- d) Define rotational stiffness factor and carryover factor in moment distribution method. [4M]
- e) Differentiate between stiffness and flexibility matrix method of analysis. [3M]
- f) Determine support moments at A and C by Kani's method for the following fig. [4M]

**PART -B**

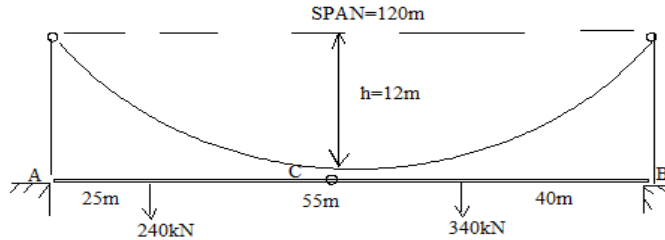
- 2 a) Determine the horizontal thrust and draw bending moment diagram, shear force diagram and find normal thrust at point 'D' of three hinged parabolic arch ACB as shown in fig.: [12M]



- b) Differentiate between three hinged and two hinged arches. [4M]
- 3 a) What are the limitations in Cantilever method of approximate analysis? [4M]
- b) Analyze the two storey rigid moment resisting frame shown in fig. by Cantilever method. Draw the BMD and SFD. Assume uniform flexural rigidity of beams and columns. [12M]

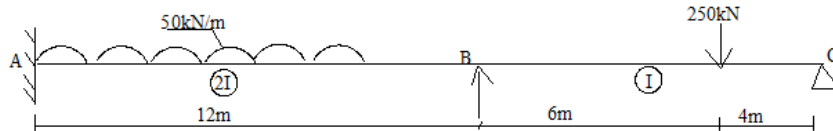


- 4 a) A three hinged stiffened girder (ACB) of suspension bridge span 120m subjected to two point loads 240kN and 340kN as shown in fig. Find Bending moment at 40m from left end. Assume supporting cable has central dip 12m. Find the maximum tension in the cable and draw bending moment diagram for the girder. [8M]



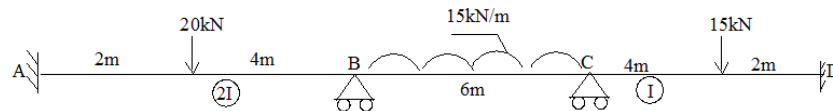
- b) A two hinged stiffened girder span 100m and central dip 10m is subjected to two point loads 200kN and 400kN at 20m and 80m from left support respectively. Find the Shear force and Bending moment at 25m from left end. Also find the maximum tension in the cable. [8M]

- 5 a) Analyze the continuous beam shown in fig. by moment distribution method. Assume  $E=2 \times 10^5$  MPa and  $I=10^8$  mm<sup>4</sup>. [10M]

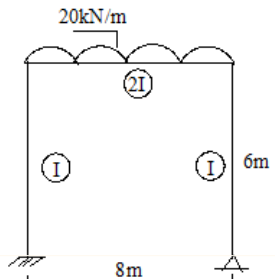


- b) Write about stiffness and carry over factors of moment distribution method. [6M]

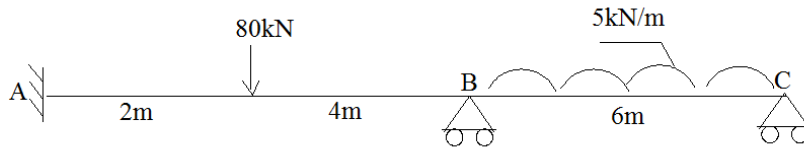
- 6 a) Analyze the continuous beam shown in fig. by Kani's method. Assume  $E=2 \times 10^5$  MPa and  $I=10^8$  mm<sup>4</sup>. [8M]



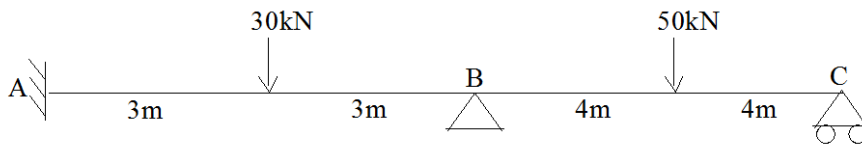
- b) Analyze the frame shown in fig. by Kani's method [8M]



- 7 a) Analyze the continuous beam shown in fig. by Flexibility method. Assume downward settlement at B and C are 10mm and 5mm respectively. And uniform flexural rigidity of beam AB and BC =  $EI = 18 \times 10^{11}$  N-mm<sup>2</sup>. [8M]



- b) Analyze the continuous beam shown in fig. by Stiffness method. Assume uniform flexural rigidity of beam AB and BC =  $EI = 12 \times 10^{11}$  N-mm<sup>2</sup>. [8M]



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**III B. Tech I Semester Regular/Supplementary Examinations, October- 2016**  
**STRUCTURAL ANALYSIS – II**  
 (Civil Engineering)

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Max. Marks: 70

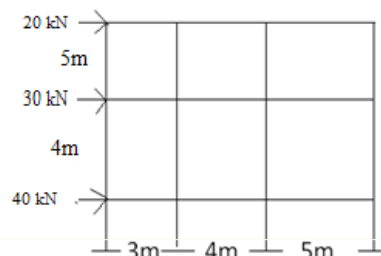
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 3. Answer any **THREE** Questions from **Part-B**

**PART –A**

- |      |  |      |
|------|--|------|
| 1 a) | Define the term an arch?   | [3M] |
| b)   | State two assumptions made in the analysis of cables.                    | [4M] |
| c)   | Define absolute stiffness of members?                                    | [4M] |
| d)   | Define carry over factor.  | [3M] |
| e)   | Mention the characteristics of the stiffness matrix?                     | [4M] |
| f)   | Mention two advantages of Kani's method over moment distribution method. | [4M] |

**PART –B**

- |      |  |       |
|------|--|-------|
| 2 a) | How are arches classified based on shape and end conditions?   | [8M]  |
| b)   | State and prove Eddy's theorem.  | [8M]  |
| 3 a) | Obtain an expression to find the length of a cable, carrying u.d.l. of "w" per unit length supported from two points distance "L" apart not at the same level, the lowest point being $h_1$ below left support and $h_2$ below right support.  | [8M]  |
| b)   | What will be the horizontal support reactions?   | [8M]  |
| 4    | Using moment distribution method analyze the two span continuous beam. The moment of inertia of AB = I while that of BC = 2I. The ends A and C are Fixed. Sketch the B.M. and S.F. diagram. Span AB carries a concentric load of 36 kN with a span of 6m and span BC carries an udl of 20 kN/m over a span of 8m.  | [16M] |
| 5    | Using Kani's method, determine the support moments for the three-span continuous beam with fixed end supports, having spans AB, BC and CD. Span AB carries an eccentric point load of 80kN, 4m span and a load at 1m from point A. Span BC carries an udl of 20 kN/m of 6m span and span CD carries a concentric point load of 60 kN having a span of 4m (EI constant). Sketch the B.M. and S.F.D. | [16M] |
| 6    | Explain the difference between flexibility method and stiffness method when applying to analysis of continuous beam  | [16M] |
| 7    | Analyse the portal frame by Portal method  | [16M] |



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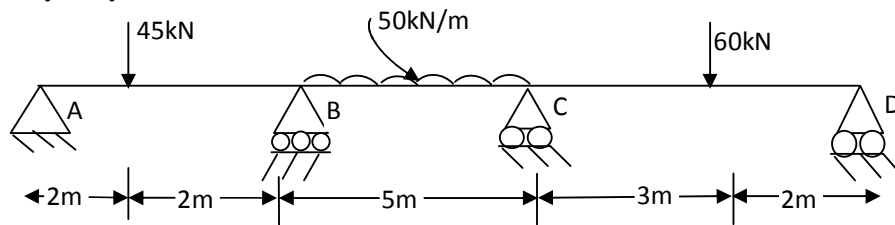
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**Part-B**

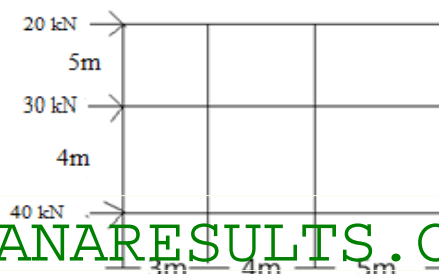
- 1 a) Define the term three hinged arch? [3M]
- b) State two assumptions made in the analysis of cables. [4M]
- c) Define stiffness factor for members? [4M]
- d) Define distribution factor at a joint. [3M]
- e) Mention the characteristics of the flexibility matrix? [4M]
- f) Write two advantages of Kani's method over moment distribution method. [4M]

**PART -B**

- 2 A three hinged parabolic arch has a span of 10m. The central rise of the arch is 2m. It is loaded with a uniformly distributed load of intensity 1 kN/m at the left 4m length. [16M]  
 (a) Calculate the maximum positive and negative bending moments.  
 (b) Calculate the bending moment, normal thrust and shear at 2m and 7.5m from left end.
- 3 A light cable 18m long is supported at two ends at the same level. The supports are 16m apart. The cable supports three loads 8, 10 and 12 N dividing the 16m distance in to four equal parts. Find the shape of the string and the tension in various portions. [16M]
- 4 Analyze the portal frame by moment distribution method. Draw the bending moment diagram and sketch the deflected shape of the structure. The two columns of AB and CD of 4m height with I, Beam BC of span 4m, with 2I. The beam BC carries an udl of 10 kN/m. The supports at A and D are fixed. [16M]
- 5 Analyze the portal frame using Kani's procedure. The two columns of AB and CD of 6m height, Beam BC of span 8m, with EI constant. The column AB carries an udl of 10 kN/m. The supports at A and D are fixed. [16M]
- 6 Analyze by stiffness method the beam shown below [16M]



- 7 Analyse the portal frame by Cantilever method [16M]



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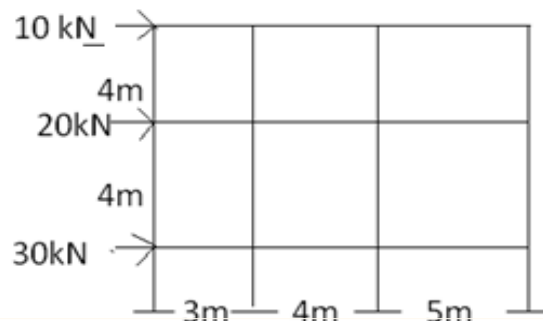
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 3. Answer any **THREE** Questions from **Part-B**

**PART -A**

- 1 a) Give an example for a statically indeterminate arch? [4M]  
 b) State two assumptions made in the analysis of cables. [3M]  
 c) State two assumptions made in the analysis of Portal method? [5M]  
 d) Define distribution factor at a joint. [4M]  
 e) Mention the characteristics of the flexibility matrix? [3M]  
 f) Write two advantages of Kani's method over moment distribution method. [3M]
  
- 2 A parabolic arch rib, 20m span and 3m rise is hinged at the abutments and the crown end carries a point load of 10KN at 7.5m from the left hand hinge.  
 a) Calculate the horizontal thrust and bending moment at a section 7.5m from right hand hinge. [8M]  
 b) What is the value of the greatest bending moment in the arch? [8M]
  
- 3 A cable is used to support five equal and equidistant loads over a span of 40m. Find the length of the cable required and its sectional area if the safe tensile stress is  $150 \text{ N/mm}^2$ . The central dip is 3.0m and loads are 6kN each. [16M]
  
- 4 Analyze the portal frame by moment distribution method. Draw the bending moment diagram and sketch the deflected shape of the structure. The two columns of AB and CD of 5m height with I, Beam BC of span 5m, with  $2I$ . The beam BC carries an udl of 15 kN/m. The supports at A and D are fixed. [16M]
  
- 5 Analyze the portal frame using Kani's procedure. The two columns of AB and CD of 6m height, Beam BC of span 10m, with EI constant. The column CD carries an udl of 20 kN/m. The supports at A and D are fixed. [16M]
  
- 6 Explain the matrix approach to structural analysis of continuous beams. [16M]
  
- 7 Analyse the portal frame by Cantilever method [16M]





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 3. Answer any **THREE** Questions from **Part-B**

**PART –A**

- |   |   |      |
|---|---|------|
| 1 | a) State Eddy's theorem?  | [3M] |
|   | b) State two assumptions made in the analysis of cables.                    | [4M] |
|   | c) State two assumptions made in the analysis of Cantilever method?         | [4M] |
|   | d) Define rotational factor at a joint.                                     | [3M] |
|   | e) Mention the characteristics of the flexibility matrix?                   | [4M] |
|   | f) Mention two advantages of Kani's method over moment distribution method. | [4M] |

**PART –B**

- |   |   |       |
|---|---|-------|
| 2 | Derive the expression for normal thrust, radial shear and horizontal thrust for a two hinged circular arch.   | [16M] |
| 3 | A light cable 24m long is supported at two ends at the same level. The supports are 20m apart. The cable supports three loads 10, 12 and 14N dividing the 20m distance in four equal parts. Find the shape of the string and the tension in various portions.                                     | [16M] |
| 4 | Analyze the portal frame by moment distribution method. Draw the bending moment diagram and sketch the deflected shape of the structure. The two columns of AB and CD of 4m height with 2I, Beam BC of span 5m, with I. The beam BC carries an udl of 20 kN/m. The supports at A and D are fixed. | [16M] |
| 5 | Analyze the portal frame using Kani's procedure. The two columns of AB and CD of 5m height, Beam BC of span 8m, with EI constant. The column AB carries an udl of 15 kN/m. The supports at A and D are fixed.   | [16M] |
| 6 | Discuss the flexibility and stiffness method with specific application to continuous beam.  | [16M] |
| 7 | Discuss the difference between Portal method and Cantilever method with an example.   | [16M] |

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**III B. Tech I Semester Supplementary Examinations, May - 2016**  
**STRUCTURAL ANALYSIS – II**  
 (Civil Engineering)

Time: 3 hours

Max. Marks: 70

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 3. Answer any **THREE** Questions from **Part-B**

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**PART -A**

- 1 a) Explain about Eddy's Theorem. [4M]
- b) State the assumptions in Portal method. [3M]
- c) What are the important characteristics of a cable? [3M]
- d) What is distribution theorem? [4M]
- e) What is the moment generated when any support sinks by an amount of  $\delta$  in any fixed beam of span  $L$  and flexural rigidity  $EI$ ? [4M]
- f) Differentiate between Degree of static and kinematic indeterminacies. [4M]

**PART -B**

- 2 Calculate the reactions and Maximum Bending Moment for the given three hinged parabolic arch as shown in fig.1 [16M]

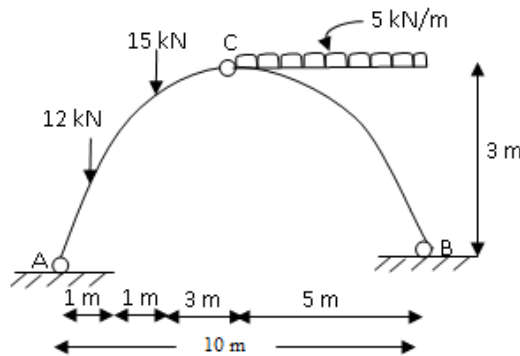


Fig.1

- 3 Analyse the frame shown in fig.2 by using Portal method. [16M]

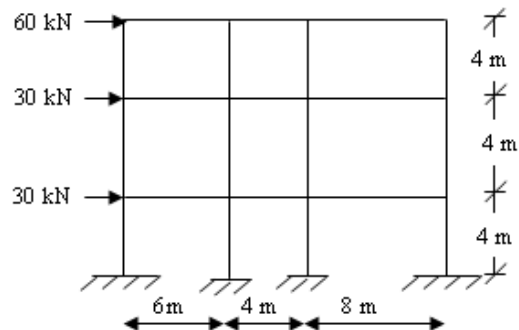


Fig.2

- 4 A suspension bridge of 120 m span has two girders supported by two cables having a central dip of 12 m. The road way has a width of 6 m. The dead load on the bridge is  $5\text{ kN/m}^2$  while the live load is  $10\text{ kN/m}^2$  which acts on the left half of the span. Determine the shear force and bending moment in the girder at 30 m from the left end. Find also the maximum tension in the cable for the position of live load. [16M]
- 5 Draw BMD for the Continuous beam shown in fig.3 by using Moment Distribution method. [16M]

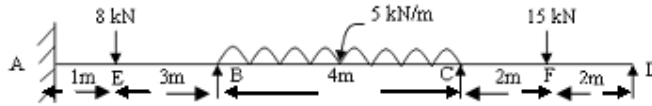


Fig.3

- 6 Analyse the frame shown in fig.4 by using Kani's method. [16M]

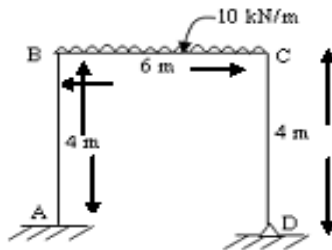


Fig.4

- 7 Draw BMD for the beam shown in fig.5 by using Flexibility method. [16M]

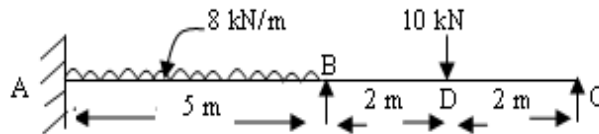


Fig.5

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**III B. Tech I Semester Regular Examinations November - 2015**  
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(Civil Engineering)

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Max. Marks: 70

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**PART –A**

- 1 a) What is the effect of temperature on three hinged arch? [3M]
- b) What are the steps involved in portal frame method? [4M]
- c) What is a suspension bridge? What is its limitation of span over a waterway? [3M]
- d) Define and explain stiffness, carry over factor and distribution factor. [5M]
- e) What is Kani's method and what is the terminology used in Kani's method? [4M]
- f) Write the steps involved in flexibility matrix method. [3M]

**PART -B**

- 2 a) A three hinged parabolic arch rib has a span of 84m and a rise 18m to the central pin at the crown. The rib carries load of intensity 2kN/m uniformly distributed horizontally over a length of 1/3 of the span from the left hand. Calculate the bending moments in the rib at the quarter span points. [12M]
- b) What is the difference between three hinge arch and two hinge arch? [4M]
- 3 a) Explain the portal method for analyzing a building frame subjected to horizontal forces. [12M]
- b) What do you understand by substitute frame method? [4M]
- 4 a) What is a general cable theorem? Deduce an expression. [12M]
- b) What are stiffening girders? Discuss their types. [4M]
- 5 A simply supported beam ABC is continuous over two spans AB and BC of 6m and 5m respectively. Span AB is carrying a uniformly distributed load of 2kN/m and span BC carries point load of 5kN at a distance of 2m from B. Find the support moment at B if EI of the beam is constant. Use moment distribution method. [16M]



- 6 Using the Kani's method analyse the frame shown in fig.1.

[16M]

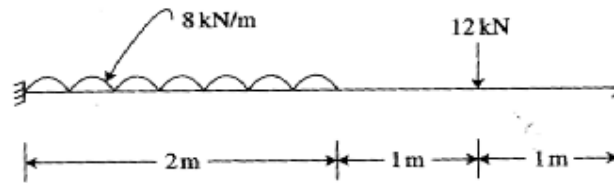


Fig.1

- 7 a) Write the steps involved in analyzing the stiffness method. [6M]  
 b) Using stiffness matrix method find the end moments at A and B for the given beam as shown in fig.2 [10M]

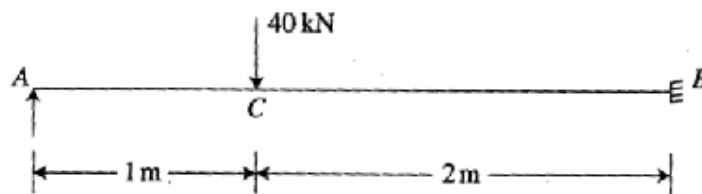


Fig.2

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\*\*\*\*\*

**PART –A**

- |   |  |      |
|---|--|------|
| 1 | a) What is the effect of rib shortening on two hinged arch?                                | [3M] |
|   | b) What are the steps involved in cantilever method?                                       | [4M] |
|   | c) Explain suspension cable on roller support with figures.                                | [3M] |
|   | d) What is a portal frame? Distinguish between symmetrical and unsymmetrical portal frame. | [5M] |
|   | e) What is Kani's method and what is the terminology used in Kani's method?                | [4M] |
|   | f) Write the steps involved in Stiffness matrix method.                                    | [3M] |

**PART -B**

- |   |  |       |
|---|--|-------|
| 2 | a) A two hinged parabolic arch rib has a span of 10m has a central rise 2.5m. It is loaded with uniformly distribute load 2kN/m over a half of the span from the left support. Determine the end reactions, horizontal thrust, maximum and minimum B.M of the arch.  | [12M] |
|   | b) Explain briefly what do you understand by an arch?  | [4M]  |
| 3 | a) Explain the cantilever method for analyzing a building frame subjected to horizontal forces.  | [12M] |
|   | b) What are the different types of substitute frames?  | [3M]  |
| 4 | a) What is a general cable theorem? Deduce an expression.  | [8M]  |
|   | b) What are stiffening girders? Discuss their types.   | [5M]  |
| 5 | A simply supported beam ABC is continuous over two spans AB and BC of 8m and 6m respectively. Span AB is carrying a uniformly distributed load of 3kN/m and span BC carries point load of 4kN at midpoint of BC. Find the support moment at B if EI of the beam is constant. Use moment distribution method. | [16M] |

- 6 Using the Kani's method analyse the frame shown in fig.1. [16M]

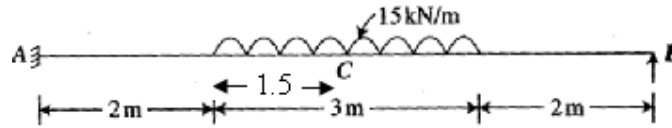


Fig.1

- 7 a) Write the steps involved in analyzing the flexibility matrix method. [8M]  
 b) Using flexibility matrix method, find the end moments at A and B for the beam shown in fig.2. [8M]

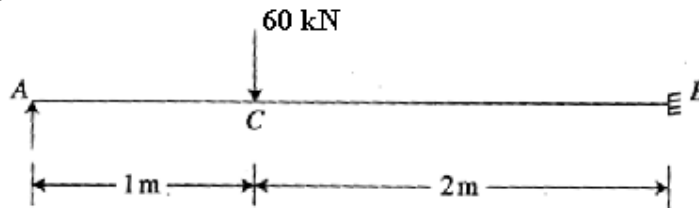


Fig.2

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**III B. Tech I Semester Regular Examinations, November - 2015**  
**STRUCTURAL ANALYSIS – II**  
(Civil Engineering)

Time: 3 hours

Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)  
2. Answering the question in **Part-A** is compulsory  
3. Answer any **THREE** Questions from **Part-B**

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**PART –A**

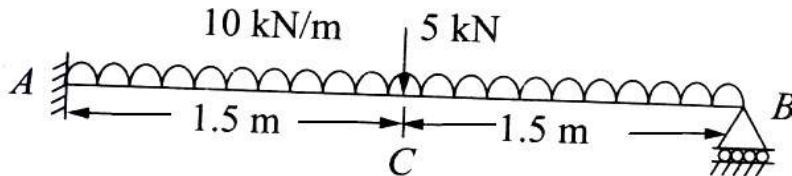
- 1 a) Find the horizontal thrust of a two hinged semi circular arch of radius R carries a concentrated load of W. [4M]
- b) Differentiate between portal frame method and cantilever method. [4M]
- c) What is a simple suspension bridge? [3M]
- d) Write the equations for continuous beam with and without sway. [4M]
- e) What is Kani's method? What are the limitations of this method? [4M]
- f) Differentiate between stiffness matrix method and flexibility matrix method. [3M]

**PART –B**

- 2 a) State and prove Eddy's theorem. [8M]
- b) A three hinged parabolic arch rib has a span of 20m and a rise 4m to the central pin at the crown. The rib carries load of intensity 2kN/m uniformly distributed horizontally on the left 3m. Calculate the maximum and minimum bending moments. [8M]
- 3 Analyse a portal frame of two storeys, two bay of 5m bay length each and height 5m. A horizontal force of 120kN is applied at top storey and 240kN is applied at lower storey. Use portal frame method [16M]
- 4 A beam ABC 8m long is fixed at A and simply supported at B with an overhang BC 2m long. The beam carries a uniformly distributed load of 12kN/m on AB and a point load of 12kN at C. Find the support moments and the support reaction. Use moment distribution method. [16M]



- 5 Analyse the beam shown below by Kani's method. [16M]



- 6 A three hinged suspension girder bridge has a span of 200m over the supports at same level. It has a central dip of 20m. The girder carries three point loads of 15kN, 25kN and 20kN acting at 35m, 80m and 150m respectively from the left end. Draw the B.M.D. [16M]
- 7 a) Using flexibility matrix method, find the end moments at A and B for a fixed beam carrying udl 4kN/m throughout. [10M]
- b) Which method is advantageous among stiffness method and flexibility method? [6M]

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**PART -A**

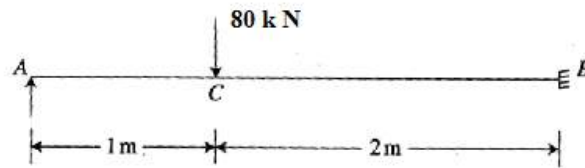
- 1 a) What is a horizontal thrust, normal thrust and radial thrust in a three hinged arch? [3M]
- b) What is a building frame? What are the different methods available for analyzing a frame? [4M]
- c) What is the effect of temperature on the cables? [4M]
- d) What is a carryover factor and distributor factor in a moment distribution method? [4M]
- e) What are the steps involved in the Kani's method? [3M]
- f) What are the steps involved in Stiffness matrix method. [4M]

**PART -B**

- 2 A three hinged parabolic arch rib has a span of 50m and a rise 20m to the central pin at the crown. The rib carries load of intensity 3kN/m uniformly distributed horizontally on the left 4m. Calculate the (i) maximum and minimum bending moments, (ii) horizontal thrust, (iii) Normal thrust and radial shear at a section 15m from A. [16M]
- 3 Write the steps involved in the Portal frame method and Cantilever method. [16M]
- 4 A fixed beam of span 6m carries a uniformly distributed load of 18kN/m. If the right support sinks by 6.5mm, find the fixing moment of the supports. Draw S.F.D and B.M.D. Take  $E = 200 \text{ kN/mm}^2$  and  $I = 5 \times 10^7 \text{ mm}^4$ . Analyse by moment distribution method [16M]
- 5 A cable hangs between two supports at a distance 120m apart. One end of the support is 3m above the other. The cable is loaded with a udl of 1 kN/m. The sag of the cable from higher end is 5m. Find the horizontal thrust and the maximum tension in the cable. [16M]
- 6 a) Write the steps for analyzing a portal frame carrying a udl by Kani's method. [8M]
- b) Draw S.F.D and B.M.D of the fixed beam of span 'l', carrying u.d.l for a distance of 'a' from one end. Use Kani's method. [8M]



- 7 a) Write the steps involved in analyzing the stiffness matrix method. [8M]  
b) Using stiffness matrix method find the end moments at A and B for the given beam [8M]



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