Code No: R1631013 **R16** SET - 1

III B. Tech I Semester Regular/Supplementary Examinations, March – 2021

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. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

~~~~~~

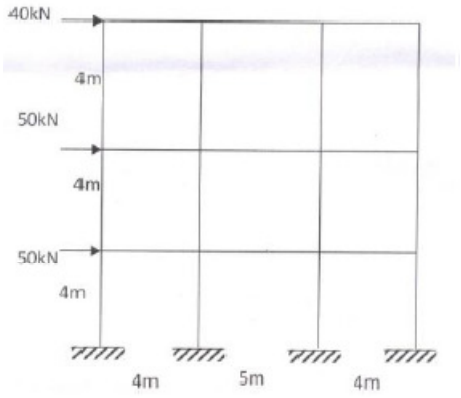
PART –A (14 Marks)

1. a) A three hinged parabolic arch of span 'l' and rise 'h' carries an udl of w/m over the whole span. Show that the arch is not subjected to any bending moment at any section. [2M]
   b) Explain portal method. [2M]
   c) Describe cable structures. Mention its needs. [2M]
   d) Why does a rigid joined frame sway? Explain. [3M]
   e) What are the advantages of Kani's method over moment distribution method? [3M]
   f) State the properties of Flexibility matrix. [2M]

PART –B (56 Marks)

2. a) A three hinged parabolic arch, hinged at the crown and springs has a horizontal span of 15 m and central rise of 3 m. It carries a UDL of 20 kN/m over the left hand half of the span. Calculate the reactions at the hinges; also calculate the values of the normal thrust, SF and BM at 1.5 m, 3 m, 7.5 m from left end. [7M]
   b) A two hinged parabolic arch of span 60 m and rise 5 m is subjected to a concentrated load of 50 kN. It has an elastic support which yields by 0.0001 mm/kN. Take $E=2x10^5$ N/mm^2, $I=5x10^9$ mm^4, average area = 10,000 mm^2, $\alpha=10x10^{-6}/^0$C. Calculate the horizontal thrust developed when the temperature rises by 20^0C. [7M]
   i) Neglecting rib shortening
   ii) Considering rib shortening.

3. Analyze the frame as shown in figure using portal method. [14M]

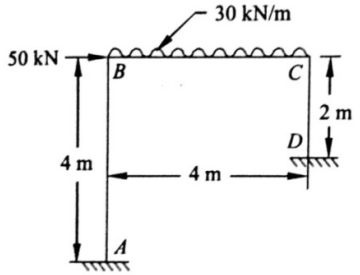


||''|''||''||''''''|
~~~~~~

4. a) A suspension cable is suspended between two points at the same level 75 m apart. It carries a UDL of 15 kN/m. Determine the minimum central dip that may be allowed if the maximum tension in the cable is limited to 1000 kN. [7M]

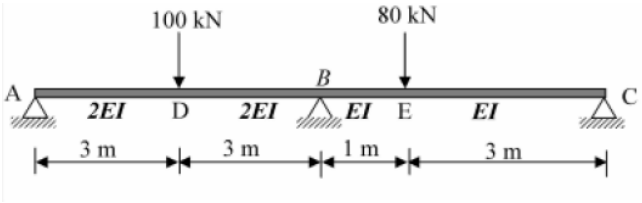
   b) What is the equation of cable and explain about general cable theorem? [7M]

5. Analyze the frame shown in figure by moment distribution method. [14M]



6. A Continuous beam ABCD fixed at A and D and continuous over supports B and C. The span AB=5 m carries a central concentrated load of 10 kN. The span BC=4m carries a uniformly distributed load of 5 kN/m over the entire span of BC. The span CD=6 m carries anon-central concentrated load of 10 kN acting at a distance of 2 m from the end D. Analyze the beam and draw bending moment diagram using Kani's method. [14M]

7. Analyze the continuous beam shown in below figure by using flexibility method. Draw SFD and BMD. [14M]



*****

Code No: R1631013 **R16** SET - 2

III B. Tech I Semester Regular/Supplementary Examinations, March – 2021

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. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

~~~~~~

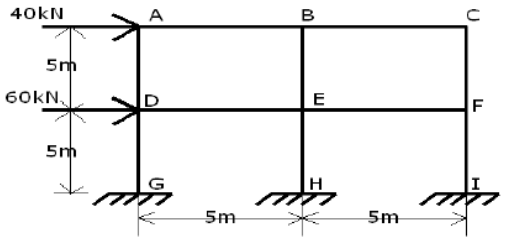
PART –A (14 Marks)

1. a) Write the expression to find the horizontal thrust in a two hinged arch. [2M]
   b) Write the assumptions in cantilever method for the analysis of frames subjected to horizontal loads. [2M]
   c) Examine the true shape of cable structures. [2M]
   d) Define rotation factor and distribution factor. [3M]
   e) Explain the procedure for analyzing a continuous beam by Kani's method. [3M]
   f) What are the properties of stiffness matrix? [2M]

PART –B (56 Marks)

2. a) A uniformly distributed load of 5000 N/m covers left hand half of the span of a three hinged parabolic arch span 36 m and central rise 9 m. Determine the horizontal thrust. Also find the Bending moment, shear force and normal thrust at the loaded quarter point. [7M]
   b) A Two-hinged semi-circular arch of radius 'R' carries an udl of w per run over the whole span. Determine the horizontal thrust. Assume uniform flexural rigidity. [7M]

3. Analyze the frame shown in below figure by cantilever method. Calculate the beam moments and column moments. Draw the bending moment diagrams. [14M]

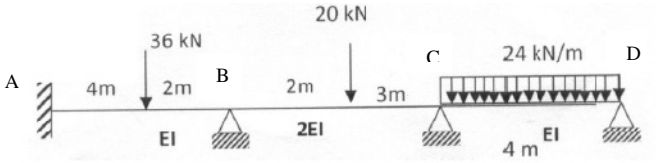


4. a) A foot bridge of width 4 m and span 60 m is carried by two cables of uniform section having a central dip of 5 m and the platform load is 6 kN/m^2. Calculate the maximum pull in the cable and also find the necessary sectional area required if the allowable stress is 120 N/mm^2. [7M]
   b) A suspension bridge of 250 m span has two no's of three hinged stiffening girdness supported by cables with a central dip of 25 m. If 4 point load of 300 kN each are placed at the centre line of the roadway at 20, 30, 40 and 50 m from the left hand hinge. Estimate the shear force and bending moment in each girder at 62.5 m from each end. Estimate also the maximum tension in the cable. [7M]

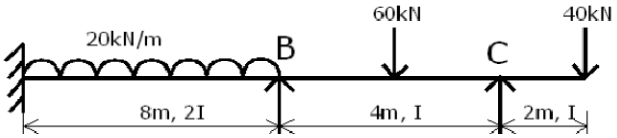
||''|''||''||''''''|
~~~~~~

Code No: R1631013 **R16** SET - 2

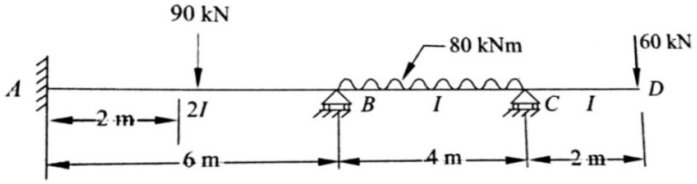
5. Analyze the continuous beam ABCD as shown in below figure using moment distribution method. The support 'B' sinks by 5 mm, for the beam $I=13160x10^4$ mm^4; $E=2x10^5$ N/mm^2. Draw BMD. [14M]



6. Analyze the continuous beam shown in below figure by Kani's method. Draw shear force and bending moment diagrams. [14M]



7. Analyze the beam shown in below figure by stiffness matrix method. Draw shear force and bending moment diagrams. [14M]



*****

||"|"||"||""""|

Code No: R1631013 **R16** SET - 3

III B. Tech I Semester Regular/Supplementary Examinations, March – 2021

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. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

~~~~~~

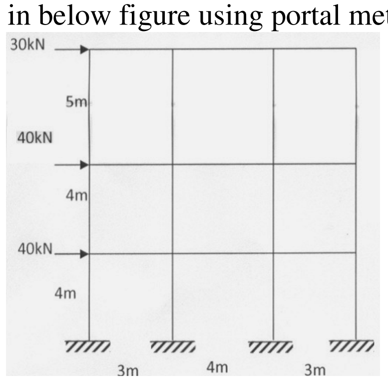
PART –A **(14 Marks)**

1. a) What is Eddy's theorem for an arch? [2M]
b) What are the assumptions made in Cantilever method? [2M]
c) Demonstrate the nature of force in the cables. [2M]
d) In a frame, four members 'PO, QO, RO and SO' meet at a joint 'O'. Members PO and RO are horizontal and have moments of inertia of *l* and *2l* with lengths of *L* and *2L* respectively. Members QO and SO are vertical and have moments of inertia of *1.5l* and *l* with lengths of *L* and *1.5L* respectively. Obtain the distribution factors at the joint. [3M]
e) Write the advantages of Kani's method. [3M]
f) Distinguish between flexibility method and stiffness method. [2M]

PART –B **(56 Marks)**

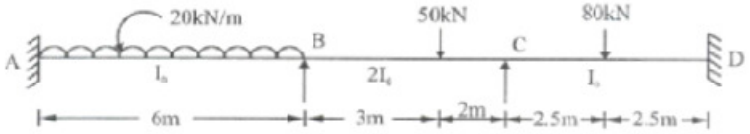
2. a) A Two-hinged parabolic arch of span 30 m and rise 6 m carries two point loads, each 60 kN acting at 7.5 m and 15 m from the left end respectively. The moment of Inertia varies as the Secant of slope of the rib axis. Determine the horizontal thrust and maximum positive moment in the arch rib. [7M]
b) A Three hinged semi-circular arch of radius R carries an udl of intensity w/unit length over its entire horizontal span. Determine the horizontal thrust and the location and magnitude of the maximum bending moment for the arch. [7M]

3. Analyze the frame shown in below figure using portal method. [14M]

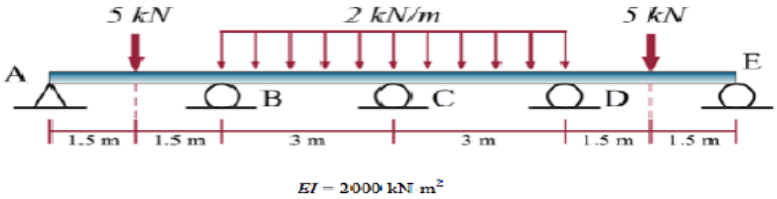


4. a) A suspension bridge of span 150 m, central dip 15 m, carries a UDL of 50 kN/m, the anchor chains are inclined at 45^0 and may be assumed to be straight. The suspension and anchor chains are attached to saddles to free to move horizontally on the piers. Determine: i) the max. and min. tension in the tensile cable, ii) the normal thrust on the piers, iii) the tension in the anchor cables. [7M]
b) Derive an expression for the length of a cable. [7M]
~~~~~~

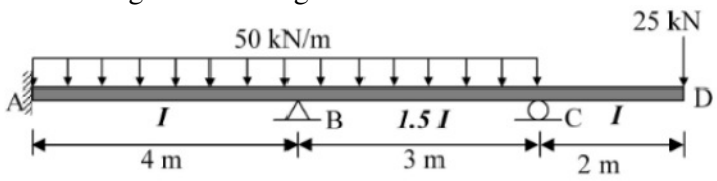
5. Analysis the continuous beam shown in below figure by moment distribution method. Draw shear force and bending moment diagrams. [14M]



6. Analyze the continuous beam shown in below figure by Kani's method. Draw shear force and bending moment diagrams. [14M]



7. Analyze the continuous beam shown in below figure by stiffness method. Draw shear force and bending moment diagrams. [14M]



*****

Code No: R1631013 **R16** SET - 4

III B. Tech I Semester Regular/Supplementary Examinations, March – 2021

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. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

~~~~~~

PART –A (14 Marks)

1. a) What is the advantage of arch action over the beam action? [2M]
   b) What are the different means by which wind loads are resisted in a building? [2M]
   c) List out the main functions of stiffening girders in suspension bridges. [2M]
   d) What are the loading conditions for maximum positive bending moment and maximum negative bending moment at centre of beam in substitute frame? [3M]
   e) When do you require sway analysis of a portal frame? Explain. [3M]
   f) A prismatic member is of length 'L' and has constant 'EI'. At each end it has one vertical coordinate and a rotation coordinate. Obtain the flexibility matrix for the element. [2M]

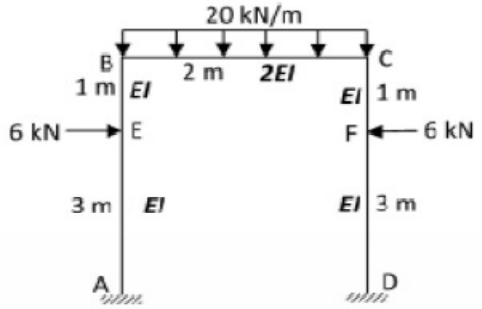
PART –B (56 Marks)

2. a) A Three hinged circular arch hinged at the springing and crown points has a span of 40 m and a central rise of 8 m. If carries a udl 30 kN/m over the left half of the span together with a concentrated load of 120 kN at the right quarter span point. Find the reactions at the supports, normal thrust and shear at a section 10 m from the left support. [7M]
   b) A Two-hinged parabolic arch of span 20 m and rise 5 m carries an udl of 40 kN/m on the left half of the span. Find the reactions at the hinges and position and magnitude of maximum positive bending moment. [7M]

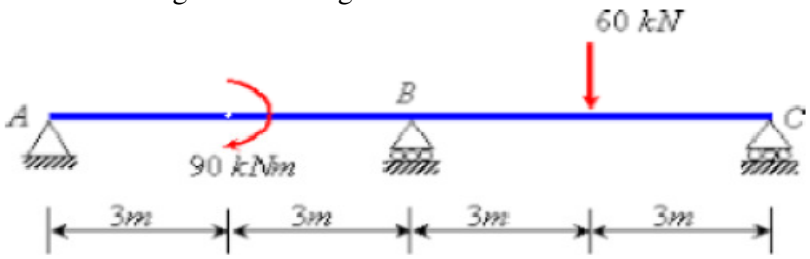
3. A single storey three span building frame is subjected to a horizontal load of 12 kN at the left top corner joint. The three spans are equal and are of magnitude 6 m. The height of the frame is 4 m and all the supports are fixed supports. Analyze the frame by portal and cantilever methods. [14M]

4. a) The horizontal of suspension cable is 60 m. The right hand support B is lower than the left hand support A by 8 m. The dip of the lowest point C below B is 2 m. If a platform load of 5 kN per horizontal meter of span is transmitted to the cable, calculate the maximum pull in the cable if the permissible tensile in the cables is 120 MN/mm^2, calculate sectional area required. The weight of the cable may be neglected. [7M]
   b) A three hinged stiffening girder of a suspension bridge of 100 m span subjected to two point loads 10 kN each placed at 20 m and 40 m, respectively from the left hand hinge. Determine the bending moment and shear force in the girder at section 30 m from each end. Also determine the maximum tension in the cable which has a central dip of 10 m. [7M]
~~~~~~

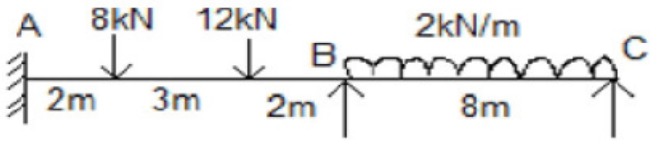
5. Analyze the portal frame shown in below figure by moment distribution method. [14M]
Draw bending moment diagram.



6. Analyze the continuous beam shown in below figure by Kani's method. Draw shear force and bending moment diagrams. [14M]



7. Analyze the continuous beam shown in below figure by flexibility method. Draw shear force and bending moment diagrams. [14M]



*****