Code No: RT22016 **R13** SET - 1

II B. Tech II Semester Regular/Supplementary Examinations, April/May-2017
STRUCTURAL ANALYSIS-I
(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 **THREE** Questions from **Part-B**

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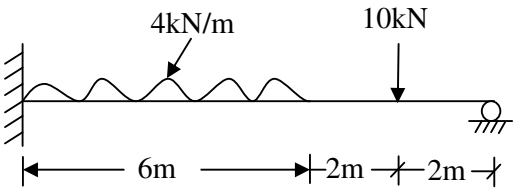
PART – A

1. a) A propped cantilever of length 'L' carries a concentrated load 'W' at its mid-span. Find the reaction at the prop.
   b) 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.
   c) Define a continuous beam.
   d) Write the expression M_{AB} in terms of fixed moments, slopes θ_A, θ_B and settlement Δ.
   e) Derive the expression for strain energy of a straight prismatic bar of length L and cross-sectional area A, if it is subjected to a bending M.
   f) Construct influence line for bending moment at a section x of a simple beam of span L.

(4M+2M+4M+4M+4M+4M)

PART – B

2. A propped cantilever beam is shown in figure. Calculate the prop Reaction and also draw the BM & SF diagrams. (16M)



3. 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. (16M)
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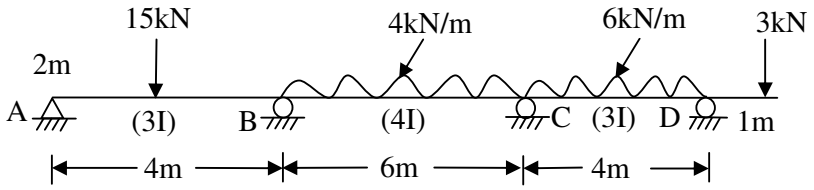
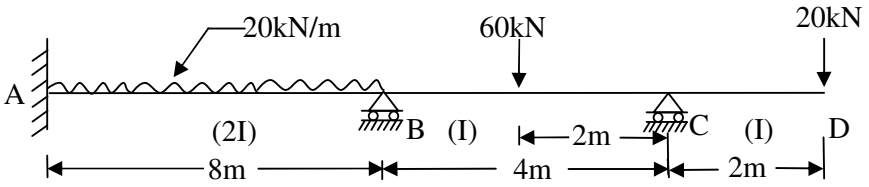
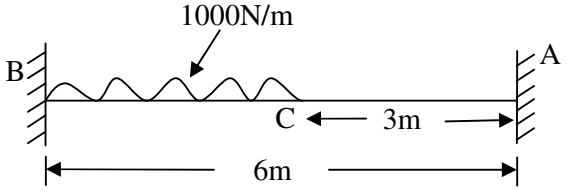
4. Analyze the continuous beam shown in figure, using three-moment equation. Draw S.F and B.M diagrams. (16M)



5. Analyse the beam ABCD shown in figure by Slope-Deflection method and draw bending moment diagram. (16M)



6. Determine the Reaction at A and the moment at B use strain Energy method. (16M)



7. Draw the Influence line diagram for reactions of a simply supported beam of 12 m span. Also draw the influence line diagrams for Shear force and bending moments at quarter span and mid-span sections (16M)

Code No: RT22016 **R13** SET - 2

II B. Tech II Semester Regular/Supplementary Examinations, April/May-2017
STRUCTURAL ANALYSIS-I
(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 **THREE** Questions from **Part-B**

~~~~~~

PART – A

1. a) A propped cantilever beam of span 6m due to a point load of 6kN at the mid span. Find the prop reaction.
   b) 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.
   c) Define a continuous beam.
   d) Write the expression M_{BA} in terms of fixed moments, slopes θ_A, θ_B and settlement Δ.
   e) State the theorem of minimum potential energy.
   f) 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. (4M+4M+2M+4M+4M+4M)

PART – B

2. 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 $E=2x10^5$ N/mm^2 and $I=10^8$ mm^4 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 (16M)

3. 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. (16M)

4. 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. (16M)
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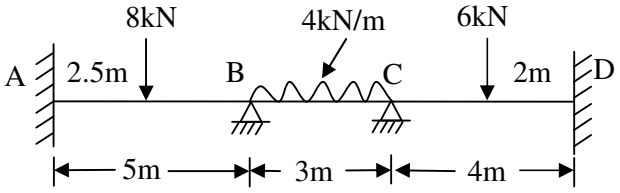
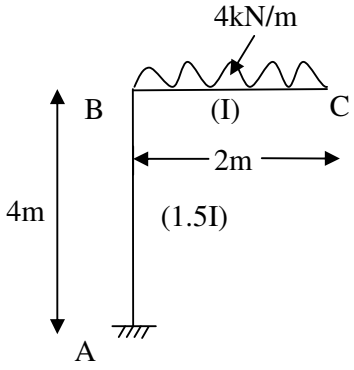
5. A continuous beam ABC consists of two spans AB of length 4m, and BC of length 3m. The span AB carries a point load of 100 KN at its middle points. The span BC carries a point load of 120 KN at 1m from C. The end A is fixed and the end C is simply supported. Find
   The moments at the supports
   The reactions at the supports and
   Draw the B.M diagram
   Use Clapeyron's theorem of three moments. (16M)

6. A continuous beam ABCD 12 m long is fixed at A and D, and is loaded as shown in figure. Analyze the beam completely if the following moments take place simultaneously (i) the end A yields, turning through 1/250 radians in a clock-wise direction (ii) end B sinks 30 mm in downward direction, (iii) end C sinks 20 mm in downward direction. The beam has constant I=33.20x10^5 mm^4 and E=2x105 N/mm^2. Use slope-deflection method. (16M)



7. Determine the horizontal and vertical component of deflection at the Point 'C' of the frame shown in figure. Take E=200x10^3 N/mm^2 and I =6x10^7 mm^4. Use Strain Energy method.
   (16M)



Code No: RT22016 **R13** SET - 3

II B. Tech II Semester Regular/Supplementary Examinations, April/May-2017
STRUCTURAL ANALYSIS-I
(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 **THREE** Questions from **Part-B**

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PART – A

1. a) A propped cantilever beam of span 5 m is loaded with a UDL of 15 kN/m on the entire span. Find the prop reaction.
   b) 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.
   c) Write Clapeyron's theorem of three moment's equation with usual notations.
   d) Write the expression M_{AB} in terms of fixed moments and slopes θ_A, θ_B.
   e) Derive the expression for strain energy of a straight prismatic bar of length L and cross-sectional area A, if it is subjected to an axial force, F.
   f) 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. (4M+4M+4M+3M+3M+4M)

PART – B

2. Find the maximum bending moment and locate the point of inflection for a propped cantilever beam of span 5 m due to a uniformly varying load, whose intensity is 5 kN/m at the fixed support and 2 kN/m at the simple support. (16M)

3. 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 $E=2.10x10^8 kN/m^2$ and $I=4.50x10^{-5}$ m^4. Find (i) Support moments, (ii) Support reactions, and (iii) Deflection at the centre. (16M)

4. 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. (16M)
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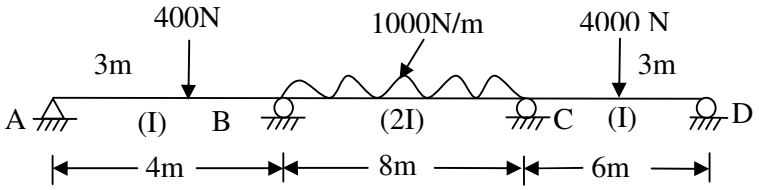
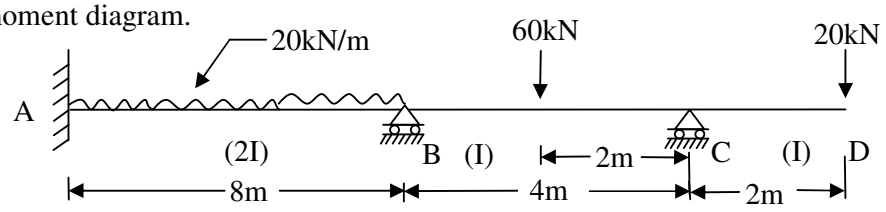
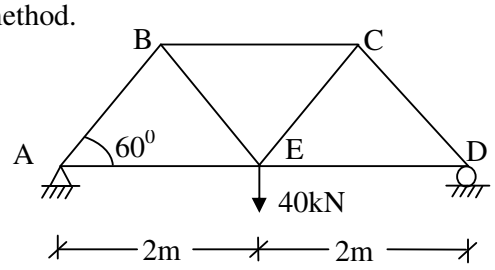
5. A continuous beam ABCD 18 m long is loaded as shown in figure. During loading support B sinks by 10 mm. Find support moments and plot shear force and bending moment diagrams for the beam. Take E = 20 kN/mm^2 , I = 8x10^6 mm^4. (16M)



6. Analyse the beam ABCD shown in figure by Slope-Deflection method and draw bending moment diagram. (16M)



7. Determine the vertical deflection of Joint 'E' for the truss shown in figure.
Take A=500x10^{-6} m^2, E=200x10^6 kN/m^2 are constant for all members.
Use Strain Energy method. (16M)



Code No: RT22016 **R13** SET - 4

II B. Tech II Semester Regular/Supplementary Examinations, April/May-2017
STRUCTURAL ANALYSIS-I
(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 **THREE** Questions from **Part-B**

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PART – A

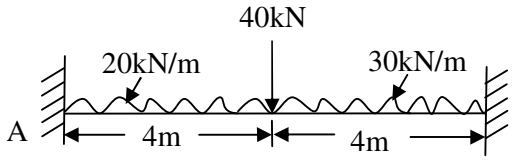
1. a) A propped cantilever beam of span 5 m is loaded with a UDL of 15 kN/m on the entire span. Find the prop reaction and moment at the fixed end.
   b) A fixed beam of span 6 m is subjected a UDL of 5 kN/m over the entire span. Find the moments at the supports.
   c) Write Clapeyron's theorem of three moment's equation with usual notations.
   d) Write the expression M_{BA} in terms of fixed moments and slopes θ_A,θ_B .
   e) Derive the expression for strain energy of a straight prismatic bar of length L and cross-sectional area A, if it is subjected a shear V.
   f) Construct influence line for a shear at a section x of a simple beam of span L.

(4M+4M+4M+3M+4M+3M)

PART – B

2. A Propped cantilever AB of span L fixed at A and simply supported at B carries a concentrated load 'P' at one third point from the fixed support. Find the reactions at the supports. Also find also the maximum deflection of the beam. EI is constant. (16M)

3. A fixed beam is shown in figure, analyze the beam and draw the SF and BM diagram (16M)



4. 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. (16M)

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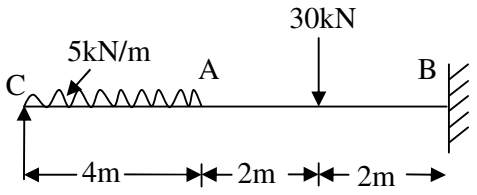
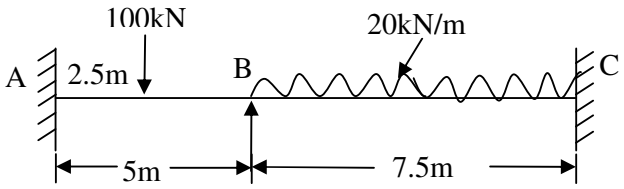
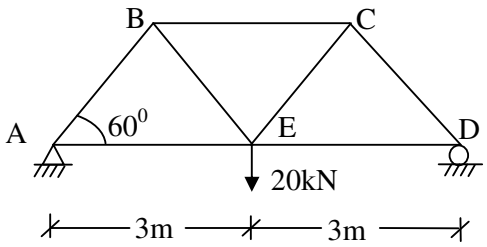
5. Draw the Shear force and bending moment diagram for the beam shown in figure. Use Clapeyron's theorem of three moments. EI=1x10^5 N/mm^2. (16M)



6. Anlayse the two-span continuous beam loaded a s shown in figure, by slope-deflection method, if the moment of inertia is span AB is I and that of span BC is 3I. Sketch the B.M and SFD (16M)



7. Determine the vertical deflection of Joint 'E' for the truss shown in figure. Take A=300x10^{-6} m^2, E=200x10^{6}kN/m^2 are constant for ball members. Use Strain Energy method. (16M)



Code No: RT22016 **R13** SET - 1

II B. Tech II Semester Supplementary Examinations, Nov/Dec-2016
STRUCTURAL ANALYSIS-I
(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 **THREE** Questions from **Part-B**

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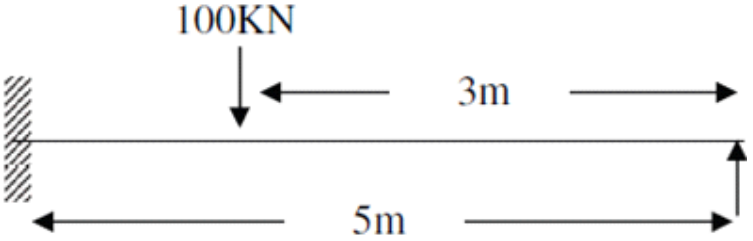
PART –A **[22M]**

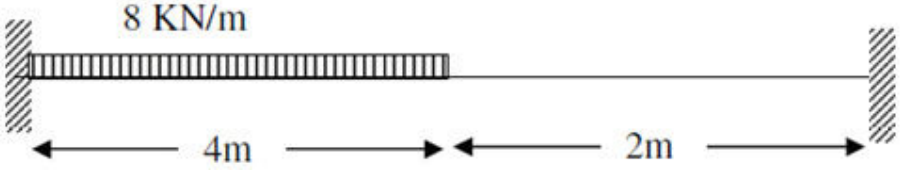
1. a) Write the difference between statically determinate and indeterminate structure?
   b) Write down the compatibility conditions for a fixed beam.
   c) What is a continuous beam? Explain the significance of choosing the bending moment as redundant by clapeyron in place of support reactions?
   d) Explain the terms Static Indeterminacy, Kinematic Indeterminacy and Degree if Indeterminacy.
   e) Explain briefly about strain energy in linear elastic system.
   f) Draw the influence diagram for a shear force at any section of a simply supported beam?

PART –B **[3×16=48M]**

2. Find the support moment for the propped cantilever loaded as shown in below figure if the support rotates clockwise by 0.003 radians. EI= 1×10^6 kgm^2.



3. Find fixed end moments for the fixed beam shown in below figure.



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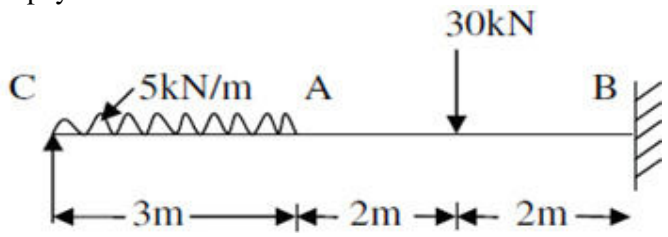
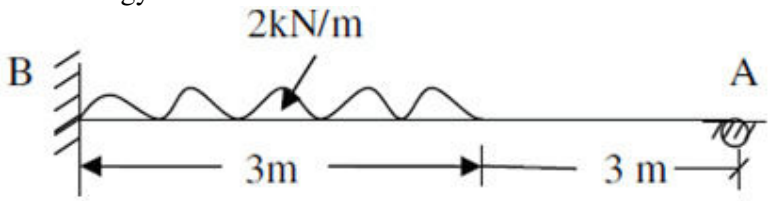
4. Draw the Shear force and bending moment diagram for the beam shown in below Figure. Use Clapeyorn's theorem of three moments. EI=1x10^5 N/mm^2.



5. 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 * 10^5N/mm^2 and 2 *$10^9$$mm^4$. Calculate the support moments and draw bending moment diagram giving critical values. Use Slope deflection method.

6. Determine the Reaction at A and the moment at B as shown in below Figure. Use Strain Energy method.



7. A System of five loads 75kN, 150kN, 150kN, 75kN and 50kN crosses a beam of 15m span with75kN leading the distance between the loads are 2.4m, 3.0m, 2.4m and 1.8m respectively. Find Maximum Bending Moment at the center of the span. Also find the absolute Maximum Bending Moment on the beam.

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Code No: RT22016 **R13** SET - 1

II B. Tech II Semester Supplementary Examinations, Dec/Jan-2015-16
STRUCTURAL ANALYSIS-I
(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 **THREE** Questions from **Part-B**

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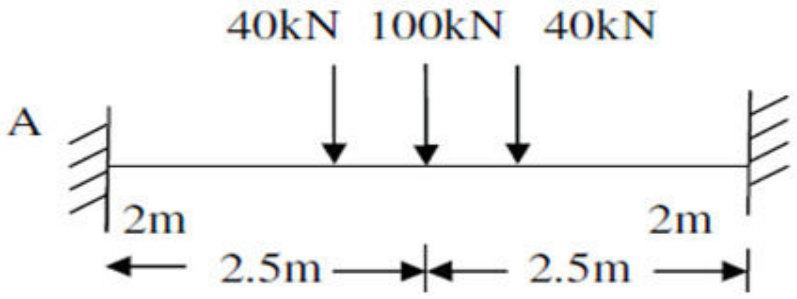
PART –A

1. a) A propped cantilever is subjected to uniformly distributed load W/m. What is the indeterminate moment at the support?
   b) How fixed beams can be statically determinate?
   c) What are the factors that affect bending moment in the continuous beam due to support settlements?
   d) Give two examples each of Statically Indeterminate and Kinematic Indeterminate structures. Calculate degree of indeterminacy in each of the cases.
   e) Define strain energy and complimentary strain energy.
   f) What are the positions of a single load for maximum bending moment at section and absolute bending moment in the span?

PART –B

2. A cantilever of 6m length carries an U.D.L of 12 kN/m over the full 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

3. A fixed beam is shown in below figure. Solve the beam and also draw the B M and S F Diagrams.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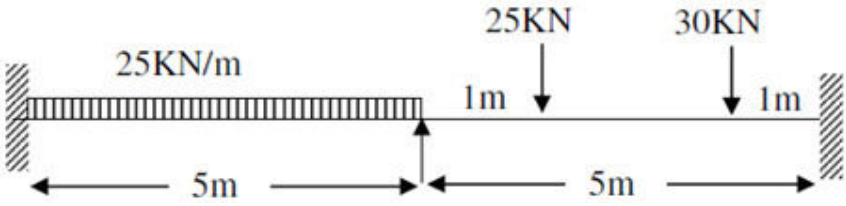
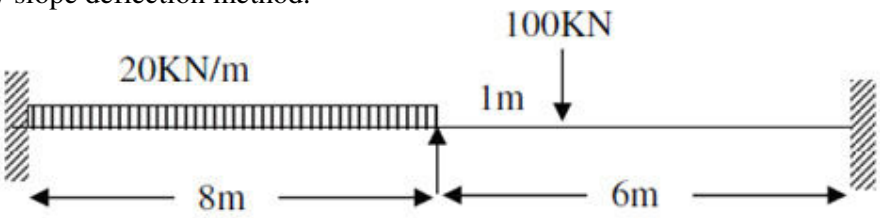
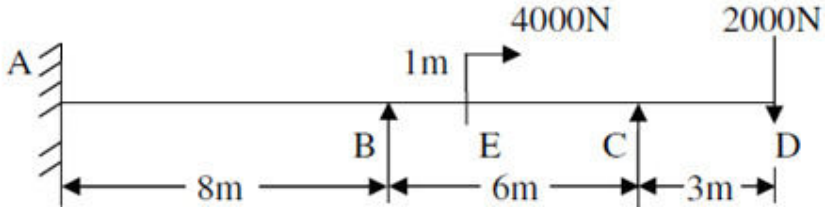
4. Solve the continuous beam in below figure by using theorem of three moments.



5. Evaluate the bending moment and shear force diagrams of beam in below figure by slope deflection method.



6. A continuous beam of constant moment of Inertia is loaded as shown in below Figure. Find support moments. Use Strain Energy method.



7. A simply supported beam of span 8 meters is loaded with three concentrated loads of 5KN, 10KNand 15KN at a distance 2m, 4m and 6m respectively from right hand end. It also carries a uniformly distributed load of 10 kN/m throughout the span. Find position and magnitude of maximum deflection and calculate Maximum Shear Force.

Code No: RT22016 **R13** SET - 1

II B. Tech II Semester Regular Examinations, May/June - 2015
STRUCTURAL ANALYSIS-I
(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 **THREE** Questions from **Part-B**

~~~~~~

PART-A

1. a) What is the degree of indeterminacy of a propped cantilever?
   b) What are the support moments when there is relative displacement at the supports?
   c) How Clapeyron's theorem of three moments can be applied to a overhanging beams?
   d) What are the sign conventions used in slope deflection equations and write the equations.
   e) State the Castigliano's first theorem.
   f) Define the influence line. Draw a I.L.D.
   g) Differentiate between determinate and indeterminate structures.

(2M+2M+3M+4M+3M+4M+4M)

PART-B

2. a) Analyse the propped cantilever beam loaded as shown in the Figure 1.Draw the S.F.D and B.M.D. Assume EI constant throughout.

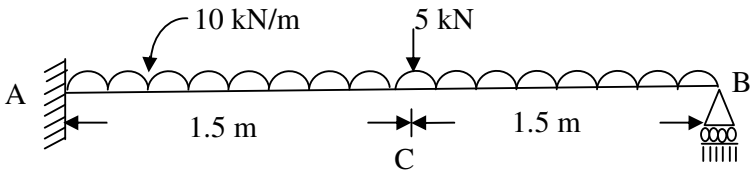


Figure 1

   b) A cantilever of length4m carries a uniformly distributed load of 1kN/m length over the whole length .The free end of the cantilever is supported on a prop. If E = 2 x 10^5 N/ mm^2 and I = 10^8 mm^4, then (i) find the prop reaction (ii) deflection at the centre of cantilever

(8M+8M)
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3. A continuous beam ABC is simply supported at A and C and continuous over support B with AB = 5m and BC = 6m.Auniformly distributed load of 12kN/m is acting over the beam. The moment of inertia is I throughout the span. Analyse the continuous beam and draw S.F.D and B.M.D. (16M)

4. Abeam ABCD 9.2m long is fixed at A and is supported at B and C at distances 4m and 7m from A with an overhang CD 2.2m long. The span AB carries a point load of 32kN at the mid span. A point load of 16kN acts at the end D. Find the moments and reactions at the supports. (16M)

5. ABC is a continuous beam with constant EI throughout its length. The end supports A and C are fixed and beam is continuous over middle support B. Span BC is uniformly loaded with 10kN per metre length ,while a concentrated vertical load of 100kN acts at the mid span AB. Calculate the moments by slope deflection method. (16M)

6. a) State and prove Castigliano's first theorem.
   b) Derive the energy stored due to axial loading. (8M+8M)

7. a) Draw the influence line diagram for a shear force at any section of a simply supported beam.
   b) Find the maximum force in the member shown in the Figure 2, when a uniformly distributed load of 10kN/m longer than the span crosses the bridge. (6M+10M)

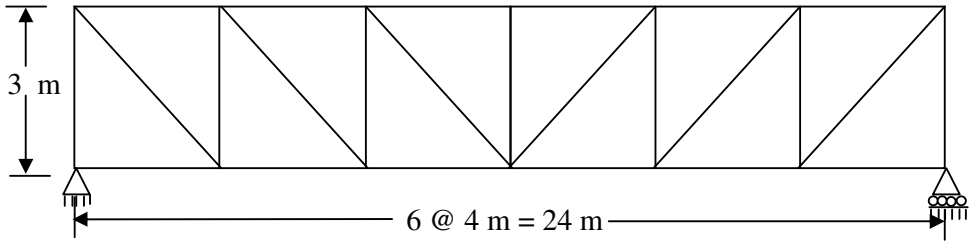

Figure 2

Code No: RT22016 **R13** SET - 2

II B. Tech II Semester Regular Examinations, May/June - 2015
STRUCTURAL ANALYSIS-I
(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 **THREE** Questions from **Part-B**

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PART-A

1. a) Draw the bending moment diagram for a propped cantilever of length *l* with u.d.l. over the whole span.
   b) What is the equation for a fixed beam with ends at different levels?
   c) What is the procedure for analysing the continuous beams using theorem of three moments?
   d) What are the sign conventions used in slope deflection equations and write the equations.
   e) State the Castigliano's first theorem.
   f) Define the influence line. Draw I.L.D for a simply supported beam for finding the reactions at the supports. (3M+3M+4M+4M+3M+5M)

PART-B

2. a) Determine the reactions of the propped cantilever beam and draw SFD and BMD.

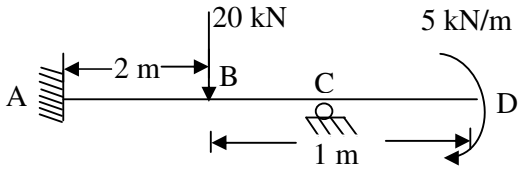

Figure 1

   b) A cantilever of length 6m carries a uniformly distributed load of 2kN/m length over the whole length. The free end of the cantilever is supported on a prop. If E = 2 x 10^5 N/ mm^2 and I = 10^8 mm^4, then (i) find the prop reaction (ii) deflection at the centre of cantilever (8M+8M)

3. A continuous beam ABC is simply supported at A and C and continuous over support B with AB = 4m and BC = 6m. A uniformly distributed load of 10kN/m is acting over the beam. The moment of inertia is I throughout the span. Analyse the continuous beam and draw S.F.D and B.M.D. (16M)
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4. Analyse the fixed beam shown in the Figure 2. (16M)

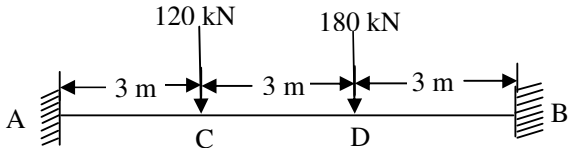

Figure 2

5. ABC is a continuous beam with constant EI throughout its length. The end supports A and C are fixed and beam is continuous over middle support B. Span BC is uniformly loaded with 12kN per metre length ,while a concentrated vertical load of 120kN acts at the mid span AB. Calculate the moments by slope deflection method. (16M)

6. a) State Castigliano's first theorem.

   b) Compute the vertical deflection of joint E by unit load method Figure 3. (4M+12M)

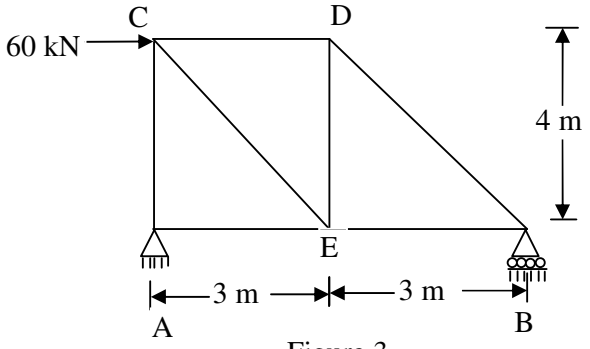

Figure 3

7. a) Draw the influence line diagram for a shear force at any section of a simply supported beam.

   b) A uniformly distributed load of 40kN/m and of length 3m transverse across the span of simply supported length of 18m.Compute the maximum bending moment at 4m from left support and absolute bending moment. (6M+10M)

Code No: RT22016 **R13** SET - 3

II B. Tech II Semester Regular Examinations, May/June - 2015
STRUCTURAL ANALYSIS-I
(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 **THREE** Questions from **Part-B**

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PART-A

1. a) Name a method for deriving the compatibility equation for the propped cantilever.
   b) Draw the shear force and bending moment diagrams for a fixed beam when one of its supports sinks.
   c) What are the merits and limitations of the theorem of three moments?
   d) What are the sign conventions used in slope deflection equations and write the equations.
   e) State and prove Castigliano's first theorem.
   f) Draw a I.L.D for a simply supported beam for finding the reactions at the supports.

(3M+4M+3M+3M+6M+3M)

PART-B

2. a) A propped cantilever beam of length *l* is subjected to uniformly distributed load of ω/m length over three fourth of its span from the fixed support.Determine the prop reaction and sketch the BMD.
   b) A cantilever of length 5m carries a uniformly distributed load of 1kN/m length over the whole length. The free end of the cantilever is supported on a prop. If E = 2 x 10^5 N/ mm^2 and I = 10^8 mm^4, then (i) find the prop reaction (ii) deflection at the centre of cantilever (iii) Magnitude and position of maximum deflection. (6M+10M)

3. A continuous beam ABC is simply supported at A and C and continuous over support B with AB = 7m and BC = 6m. A uniformly distributed load of 14kN/m is acting over the beam. The moment of inertia is I throughout the span. Analyse the continuous beam and draw S.F.D and B.M.D. (16M)
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4. Analyse the fixed beam shown in the Figure 1. (16M)

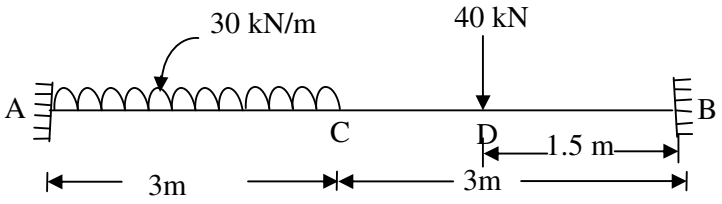

Figure 1

5. ABC is a continuous beam with constant EI throughout its length. The end supports A and C are fixed and beam is continuous over middle support B. Span BC is uniformly loaded with 14kN per metre length ,while a concentrated vertical load of 140kN acts at the mid span AB. Calculate the moments by slope deflection method. (16M)

6. a) State and prove Castigliano's first theorem.
   b) Compute the vertical deflection of joint E by unit load method Figure 2. (8M+8M)

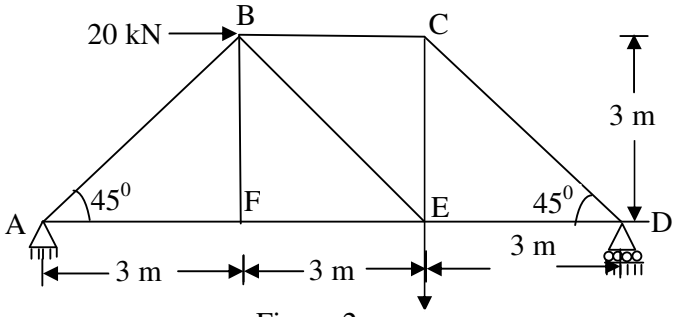

Figure 2

7. a) Draw the influence line diagram for a bending moment at any section of a simply supported beam.
   b) A uniformly distributed load of 50kN/m and of length 4m transverse across the span of simply supported length of 18m.Compute the maximum bending moment at 5m from left support and absolute bending moment. (6M+10M)

Code No: RT22016 **R13** SET - 4

II B. Tech II Semester Regular Examinations, May/June - 2015
STRUCTURAL ANALYSIS-I
(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 **THREE** Questions from **Part-B**

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PART-A

1. a) What is a propped cantilever? What is the degree of indeterminacy?
   b) Draw the shear force and bending moment diagrams for a propped cantilever when the prop sinks.
   c) State and deduce the Clapreyon's three-moment equation.
   d) What are the sign conventions used in slope deflection equations and write the equations.
   e) State and prove Castigliano's first theorem.
   f) Draw Influence line diagrams for a Pratt truss (4M+4M+3M+3M+3M+5M)

PART-B

2. a) A propped cantilever beam of length *l* is subjected to uniformly distributed load of ω/m length over three fourth of its span from the fixed support.Determine the prop reaction and sketch the BMD.
   b) A cantilever of length 7m carries a uniformly distributed load of 3kN/m length over the whole length. The free end of the cantilever is supported on a prop. If $E = 2 \times 10^5$ N/ mm^2 and $I = 10^8$ mm^4, then (i) find the prop reaction (ii) Magnitude and position of maximum deflection. (8M+8M)

3. A continuous beam ABC is simply supported at A and C and continuous over support B with AB = 7m and BC = 6m. A uniformly distributed load of 14kN/m is acting over the beam. The moment of inertia is I throughout the span. Analyse the continuous beam and draw S.F.D and B.M.D. (16M)
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4. A fixed beam AB of length 3m carries a point load of 45kN at a distance of 2m from A. If the flexural rigidity is of the beam is 1 x 10^4 kNm^2, determine (i) the fixed end moments at A and B. (ii) Deflection under the load and (iii) maximum deflection. (16M)

5. ABC is a continuous beam with constant EI throughout its length. The end supports A and C are fixed and beam is continuous over middle support B. Span BC is uniformly loaded with 8kN per metre length ,while a concentrated vertical load of 80kN acts at the mid span AB. Calculate the moments by slope deflection method. (16M)

6. a) State and prove Castigliano's first theorem.
   b) Compute the vertical deflection of joint E by unit load method Figure 1. (4M+12M)

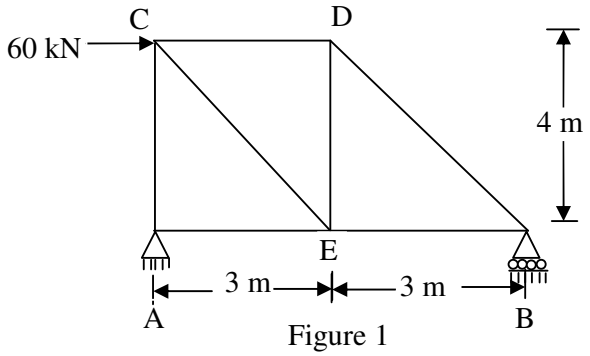

Figure 1

7. a) Draw the influence line diagram for a shearforce at any section of a simply supported beam.
   b) A uniformly distributed load of 60kN/m and of length 4m transverse across the span of simply supported length of 20m.Compute the maximum bending moment at 5m from left support and absolute bending moment. (6M+10M)