Code: 20A01402

R20

B.Tech II Year II Semester (R20) Regular & Supplementary Examinations April/May 2024

STRUCTURAL ANALYSIS - I

(Civil Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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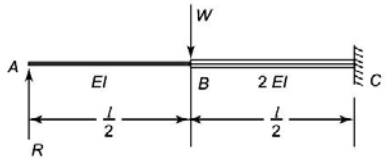
1 Answer the following: (10 X 02 = 20 Marks)

(a)	State Castigliano's first theorem.	2M
(b)	Define internally and externally indeterminate Structures.	2M
(c)	Write Clapeyron's theorem of three moments for point load & for uniformly distributed load.	2M
(d)	What are the advantages and disadvantages of fixed beam over simply supported beam?	2M
(e)	What are the assumptions made in slope-deflection method?	2M
(f)	How do you account for sway in slope deflection method for portal frames?	2M
(g)	What is the difference between absolute and relative stiffness?	2M
(h)	Define Stiffness Factor.	2M
(i)	State Eddy's theorem.	2M
(j)	Distinguish between two hinged and three hinged arches.	2M

PART – B

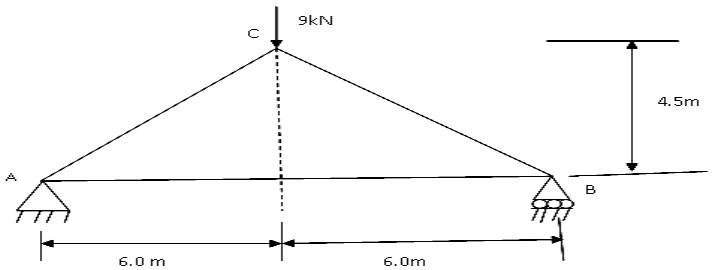
(Answer all the questions: 05 X 10 = 50 Marks)

2 Using Castigliano's theorem, determine the prop reaction of a cantilever beam propped at the free end and loaded as shown in figure below. 10M

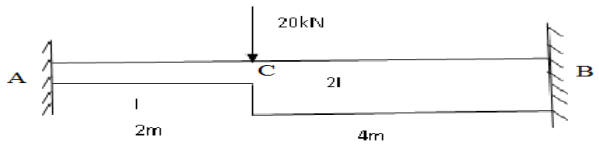


OR

3 Find the vertical and horizontal deflections of the joint C of the pin jointed truss shown in figure. The area of the horizontal member is 150 mm^2. The areas of the members AC and BC are 200 mm^2 each. Take E = 200 kN/mm^2. 10M



4 For the fixed beams shown in figure, the left support of the beam rotates by 0.03 radians clockwise. EI = 10^4 $kN\text{-}m^2$. Compute the fixed end moments. Draw Bending moment diagram. 10M



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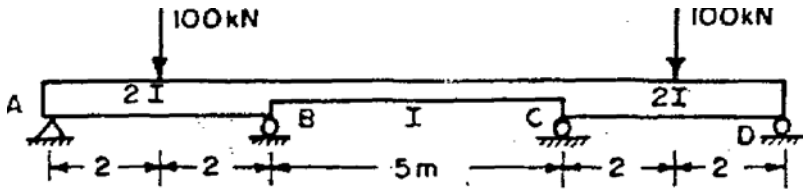
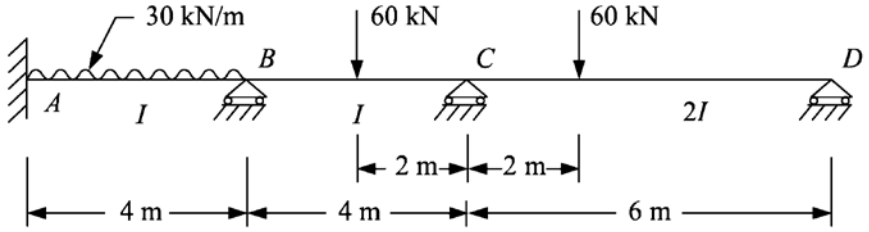
5 For a three span beam shown in figure, find the reactions and support moments, and draw the bending moment and shear force diagrams. 10M

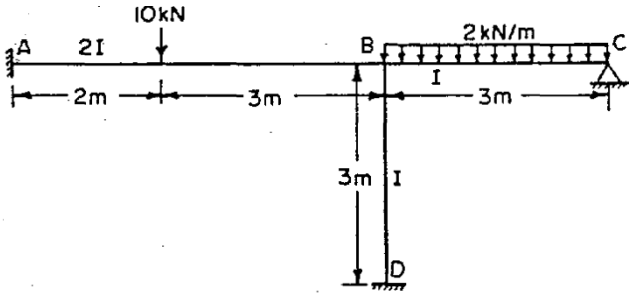


6 Analyse the continuous beam ABCD shown in figure by slope deflection method and draw bending moment diagram. 10M

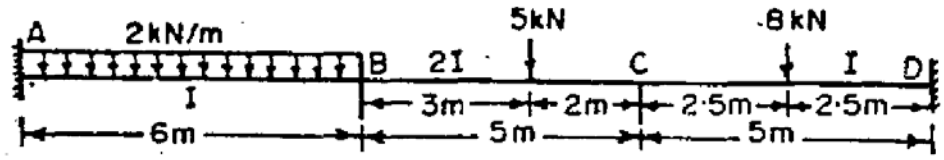


OR

7 A continuous beam ABC is supported on an elastic column BD and is loaded as shown in figure. Treating joint B as rigid, analyse the frame using slope deflection method and plot the bending moment diagram and the deflected shape of the structure. 10M



8 A continuous beam ABCD consists of three span, and is loaded as shown in figure below. Ends A and D are fixed. Using moment distribution method, determine the bending moments at the supports and plot the bending moment diagram. 10M



OR

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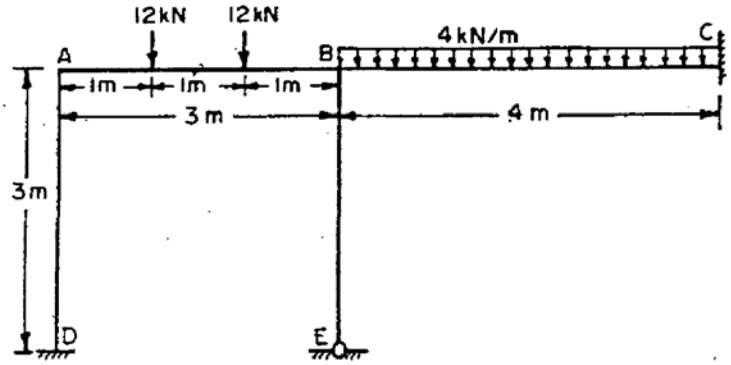
9 The continuous beam shown in Figure has rigidly fixed ends at C and D, is pinned at E and has rigid Joints at A and B. The members are of uniform section and material throughout. Using moment distribution methods, Sketch the bending moment diagram for the frame, showing all important values. Also, find the values of the horizontal and vertical reactions at D and E. 10M



10 A parabolic arch hinged at the springings and crown has a span of 20 m. The central rise of the arch is 4 m. It is loaded with a uniformly distributed load of intensity 2 kN/m on the left 8 m length. Calculate (i) The direction and magnitude of reaction at the hinges, (ii) The bending moment, normal thrust and shear at 4 m and 15 m from the left end, (iii) maximum positive and negative bending moments. 10M

OR

11 A parabolic arch, hinged at the ends has a span 30 m and rise 5 m. A concentrated load of 12kN acts at 10 m from the left hinge. The second moment of area varies as the secant of the slope of the rib axis. Calculate the horizontal thrust and the reactions at the hinges. Also, calculate the maximum bending moment anywhere on the arch. 10M

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Code: 20A01402

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B.Tech II Year II Semester (R20) Regular & Supplementary Examinations August/September 2023

STRUCTURAL ANALYSIS - I

(Civil Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a)	Define Castigliano's first theorems.	2M
(b)	Write about kinematic indeterminacy.	2M
(c)	Differentiate statically of determinate and indeterminate beams.	2M
(d)	Define degrees of freedom.	2M
(e)	Write down the equilibrium equations used in slope deflection methods.	2M
(f)	Write slope formula for cantilever beam with UDL.	2M
(g)	State relative merit of moment distribution method over slope deflection method.	2M
(h)	Why is slope deflection equation method known as stiffness method?	2M
(i)	Write about the loads acting on arches.	2M
(j)	What is a three hinged arch?	2M

PART – B

(Answer all the questions: 05 X 10 = 50 Marks)

2 Define Strain energy. Derive an expression for strain energy for a linear elastic system under axial load. 10M

OR

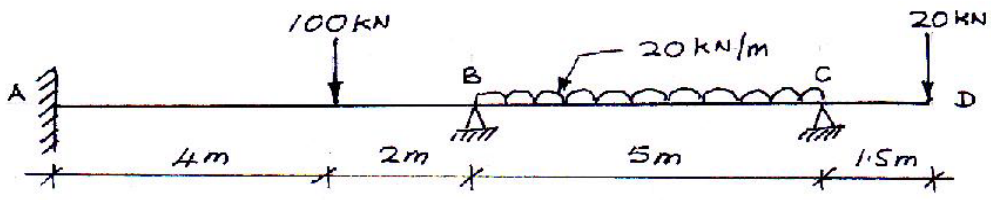
3 For a cantilever beam of length 3.5 m, the uniform flexural stiffness is propped at the remote end. Find the load on the prop when a load 6 kN is applied at the centre (1.75 m) of the cantilever beam. 10M

4 A two span continuous beam ABC is fixed at A and simply supported at B and C. The span AB=6m and span BC=5m. The span AB carries a UDL of 23 kN/m and span BC carries a central point load of 26 kN. EI is constant for the whole beam. Find the moments and reactions at all the supports and draw the bending moment diagram using theorem of three moments. 10M

OR

5 A fixed beam AB of span 8 m is subjected to a point load of 64 kN at 2 m from A and a clockwise couple of 20 kN-m at mid-span. Find the fixed end moments. Draw the B.M.D. and S.F.D. 10M

6 Analyse the continuous beam ABCD shown in figure by slope deflection method. The support B sinks by 15 mm. Take E = 200 X10^5 KN/m^2 and I = 120 X10^{-6} m^4 10M



OR

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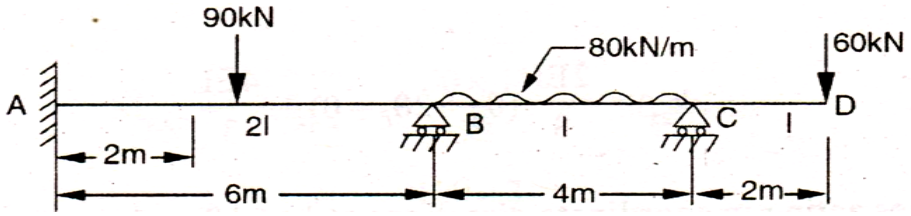
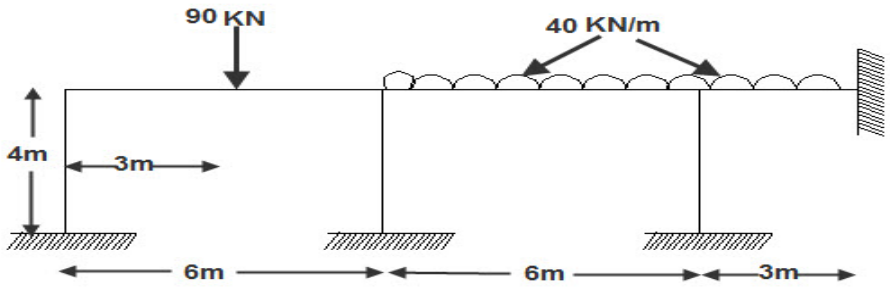
7 A two span continuous beam ABC is fixed at A and simply supported at C. It is continuous over support B. The span AB = 4.8 m and span BC = 6.1 m. The span AB carries a UDL of 9 KN/m and span BC carries a central point load of 11 KN. EI is constant for the whole beam. Find the support moment at B and draw the shear force and bending moment diagrams using slope-deflection method. 10M

8 Analyze the beam shown in figure below using moment distribution method. Sketch the BMD. 10M



OR

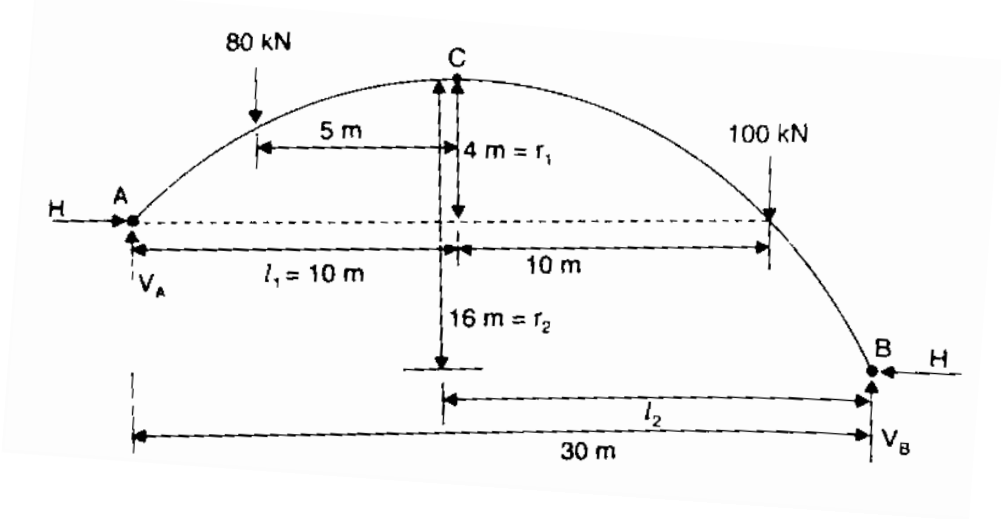
9 Analysis the rigid jointed frame shown in figure by moment distribution method and draw Shear force diagram and bending moment diagram. 10M



10 A two hinged parabolic arch of span 'l' and rise 'r' carries a UDL of w/meter run over the left hand half of the span. The moment of inertia varies as secant of the slope of rib axis. Derive the expression for the horizontal thrust at the hinges. Calculate the horizontal thrust and bending moment at quarter span point on the right half of the span if l = 20 m; r = 4 m; w = 20 KN/m. 10M

OR

11 A three hinged parabolic arch of span 30 m has its supports at depths of 4 m and 16 m below crown C. The arch carries a load of 80 kN at a distance of 5 m to the left of C and a second load of 100 kN at 10 m to the right of C. Determine the reactions at supports and bending moments under the loads. 10M



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