GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–V (NEW) EXAMINATION – WINTER 2020

Subject Code:3150614 Date:03/02/2021

Subject Name:Structural analysis-II

Time:10:30 AM TO 12:30 PM Total Marks: 56

Instructions:

1. **Attempt any FOUR questions out of EIGHT questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

			Marks
Q.1	**(a)**	Define portal frame. Discuss the causes of sway in a portal frame.	**03**
	(b)	Define: 1) Distribution Factor 2) Relative stiffness	**04**
	(c)	Analyse the two storey portal frame shown in figure-1.Consider UDL Value=3 KN/Meter.	**07**
Q.2	**(a)**	Discuss the uses of slope deflection method.	**03**
	(b)	Derive shear equation in the case of analyzing the portal frame with side sway.	**04**
	(c)	Analyse the beam shown in figure-2 by slope deflection method. Also plot BMD.	**07**
Q.3	**(a)**	Discuss framed structures and enlist the types of framed structures.	**03**
	(b)	Discuss actions and displacements.	**04**
	(c)	Write the differences between Stiffness Method and Flexibility Method.	**07**
Q.4	**(a)**	State and prove the Castingliano's 1^{st}Theorem.	**03**
	(b)	Calculate the central deflection for a simply supported beam of length 'l' subjected to audl'w'throughout its span using Castingliano's 1^{st}Theorem.	**04**
	(c)	Analyse the beam shown in figure-3 by Flexibility Method.	**07**
Q.5	**(a)**	Discuss Castingliano's 2^{nd} Theorem.	**03**
	(b)	Determine the reactions at the supports for a propped cantilever beam of length 'l' subjected to a udl 'w'throughout its span using principle of minimum strain energy.	**04**
	(c)	For a cantilever beam, show that stiffness and flexibility matrices are reciprocal to each other.	**07**
Q.6	**(a)**	What is influence line diagram? What is the significance of influence line diagram?	**03**
	(b)	State Mullar Breslau's principle.	**04**
	(c)	Draw the influence line diagrams for support reactions V_a and V_b for a propped cantilever beam shown in figure-4.	**07**
Q.7	**(a)**	Calculate the deflection at the free end of a cantilever beam subjected to udl using Castingliano's 1^{st} Theorem.	**03**
	(b)	Discuss Castingliano's 2^{nd} Theorem to solve an indeterminate truss.	**04**
	(c)	Draw the Influence line diagram for Reactions at the supports and shear force and bending moments at any section C for a simply supported beam.	**07**
Q.8	**(a)**	Discuss limitations of Castingliano's 1^{st} Theorem.	**03**
	(b)	Write the characteristics of ILD for statically indeterminate structures.	**04**

(c) A train of loads shown in figure-5 crosses a simply supported girder **07**

of span 18m from left to right. Calculate maximum SF and BM at section 8m from left.

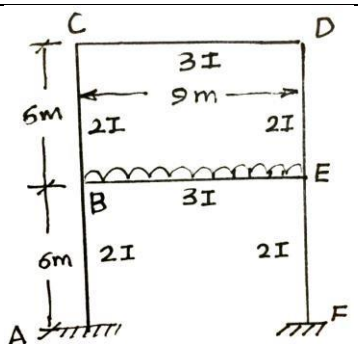

Figure-1

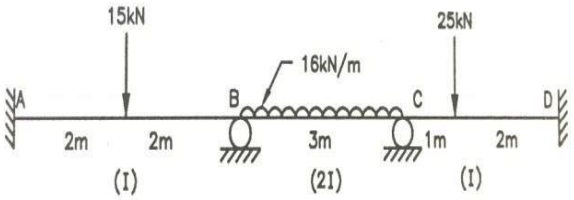

Figure-2

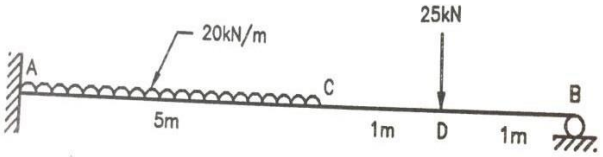

Figure-3

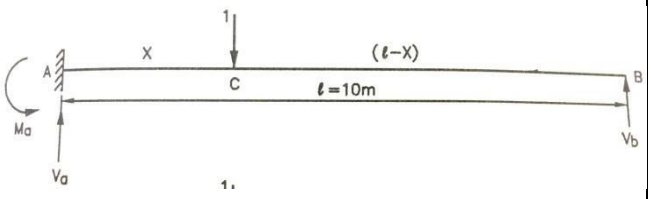

Figure-4

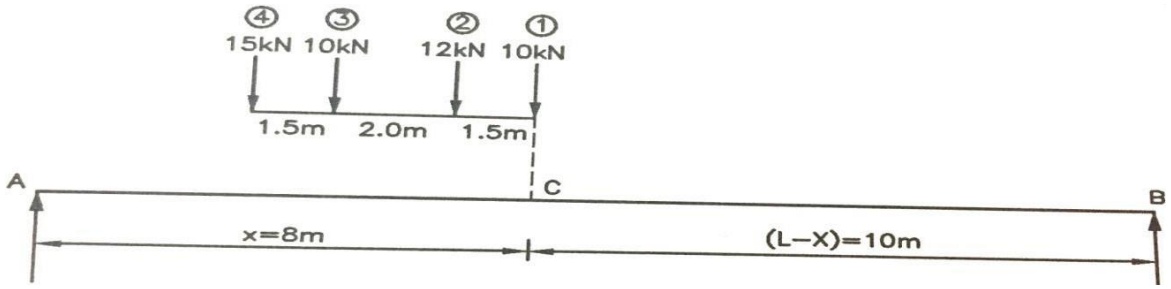

Figure-5

Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V (NEW) EXAMINATION – WINTER 2021

Subject Code:3150614 Date:20/12/2021

Subject Name:Structural analysis-II

Time:02:30 PM TO 05:00 PM Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	Define (a) Distribution Factor (b) Carry over moment (c) Influence line	**03**
	(b)	Explain (a) Castigliano's first Theorem (b) Flexibility	**04**
	(c)	Derive Slope Deflection Equation using fundamentals with usual notations.	**07**
Q.2	**(a)**	Explain Muller Breslau principle with appropriate sketches.	**03**
	(b)	Write Characteristics of stiffness matrix.	**04**
	(c)	Using Castigliano's first theorem calculate deflection at free end of cantilever beam shown in Figure.1. Take E =2 x 10^5 N/mm^2 and size of beam as 230x300 mm	**07**
		OR	
	(c)	Determine Reaction R_A and R_B for the propped cantilever beam shown in the Figure. 2 using Castigliano's second theorem.	**07**
Q.3	**(a)**	Write Slope deflection Equation for the beam shown in figure 3.	**03**
	(b)	Analyze the beam shown in figure 3 using slope deflection method and draw bending moment diagram only.	**04**
	(c)	Analyze the frame shown in the figure 4 using slope deflection method and draw bending moment diagram only.	**07**
		OR	
Q.3	**(a)**	Differentiate between stiffness and flexibility method	**03**
	(b)	Discuss causes of sidesway in analysis of frame.	**04**
	(c)	Analyze the beam shown in the figure 3 using moment distribution method and draw bending moment diagram.	**07**
Q.4	**(a)**	Four loads of 30 KN, 40 KN, 30 KN and 20 KN are applied on 9 m mt long beam as shown in figure 5. Draw influence line for shear force at point C located at 5 m from left. Also find maximum positive and negative shear force at point C for given loading.	**03**
	(b)	Draw influence line for bending moment at point C for the beam shown in figure 5 and find maximum bending moment at C for given loading on beam.	**04**
	(c)	Four loads of 20 KN,15 KN,17 KN and 15 KN as shown in Figure 6 are passing from left to right on simply supported beam of span 22 mt with 15 KN load as leading load. Calculate max S.F. and B.M. at point C located at 10 mt from left end.	**07**
		OR	
Q.4	**(a)**	Draw influence line for 4 m long beam for reaction at B (R_B) as shown in figure 7. Calculate ordinates at 1 mt. interval.	**07**
	(b)	Draw influence line for reaction at B (R_B) for the 14 mt long two-span beam shown in figure 8. Calulate ordinate at 2 mt interval.	**07**
Q.5	**(a)**	Find flexibility matrix only for the beam shown in figure 9 considering M_A and M_B as redundant.	**07**

(c) Analyze the beam shown in figure 3 by matrix method and draw bending moment diagram only. **07**

OR

Q.5 **(a)** Write assumptions made is cantilever method of approximate analysis. **03**

(b) Draw only Qualitative influence line diagram for following functions of 2 span continuous beam having support reaction R_A, R_B and R_C. The point D is located at center of right span BC **04**

(a) Influence line for R_C
(b) Influence line for R_A
(c) Influence line for shear at D
(d) Influence line for bending moment at D.

(c) Analyze the frame shown in figure 10 by portal method and draw shear force and axial force diagram only. **07**

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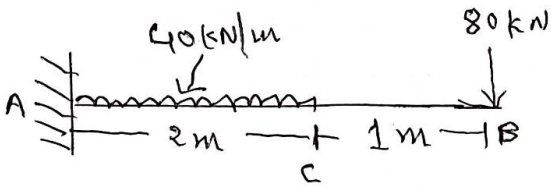


Fig-1 Q-2(c)

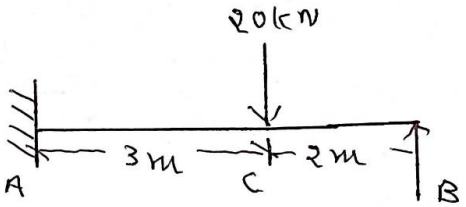


Fig-2 Q-2(c) OR

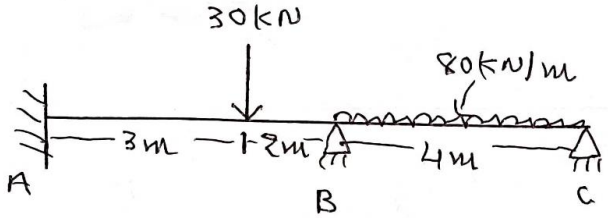


Fig-3

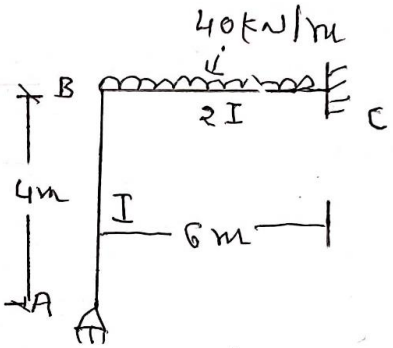


Fig-4 Q-3(c)

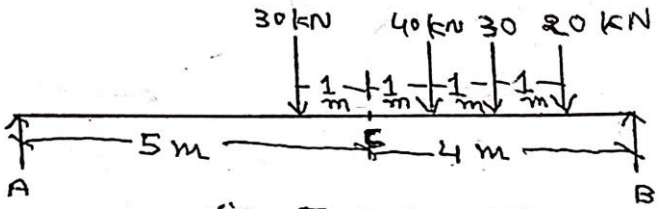
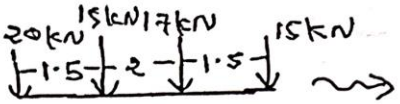


fig – 5 Q-4 (a)(b)



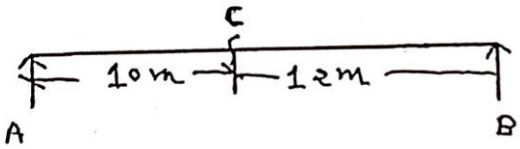


fig – 6 Q-4 (c)

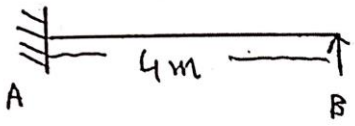


fig – 7 Q-4 (a) OR

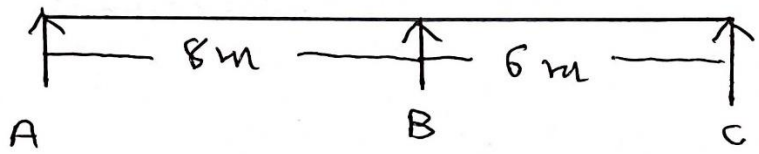


fig-8 Q-4(b) OR

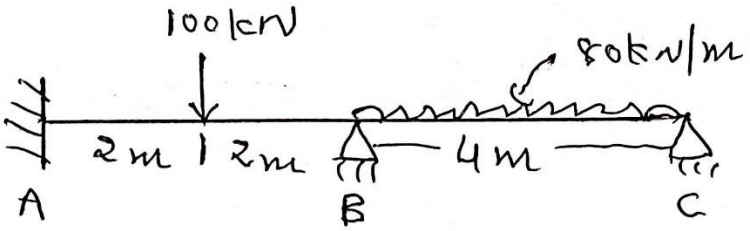


fig-9 Q-5(a)

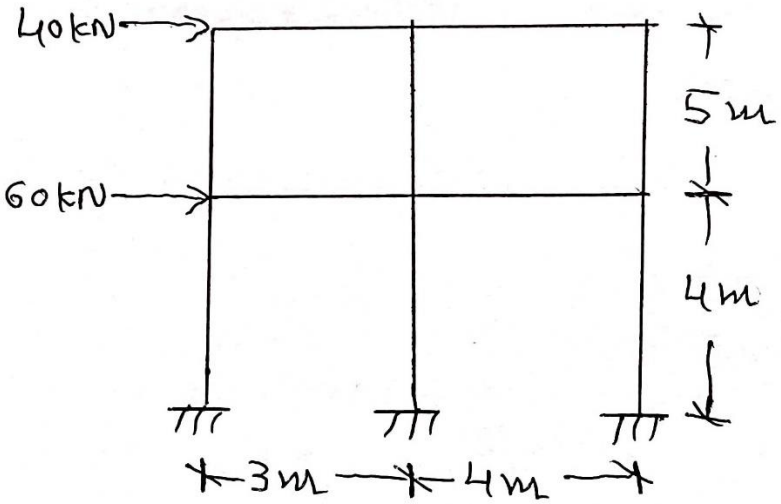


fig-10 Q-5(c) OR

Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V (NEW) EXAMINATION – SUMMER 2021

Subject Code:3150614 Date:17/09/2021

Subject Name:Structural analysis-II

Time:10:30 AM TO 01:00 PM Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	State Castigliano's first theorem and its usefulness in analysis of structures.	**03**
	(b)	Explain following terms: Stiffness, Distribution factor, Carry over factor, Carry over moment.	**04**
	(c)	Draw the shear force and bending moment diagrams for the beam shown in **Fig.1**. Use Moment Distribution Method.	**07**
Q.2	**(a)**	Find out Distribution factor for the frame shown in **Fig. 2**	**03**
	(b)	Write only slope deflection equations for the frame shown in **Fig. 3.**	**04**
	(c)	Analyze and Draw the SFD & BMD for the beam shown in **Fig. 4** by slope deflection method.	**07**
		OR	
	(c)	Analyze and Draw the SFD & BMD for the beam shown in **Fig. 4** by Moment distribution method.	**07**
Q.3	**(a)**	State and explain Castigliano's second theorem with example.	**03**
	(b)	Using Castigliano's first theorem, calculate vertical displacement at free end C for the cantilever beam as shown in **Fig. 5** Take E = 2 x 10^5 N/mm^2 and I = 7 x 10^8 mm^4	**04**
	(c)	A propped cantilever beam of span 8 m has fixed support at left end and roller support at right end. It is loaded by a UDL of 15 kN/m up to 4 m from left support. Analyze the beam by Energy principle and draw BMD.	**07**
		OR	
Q.3	**(a)**	Calculate Slope and Deflection at free end of a cantilever beam as shown in **Fig. 6** using unit load method. Take EI = constant	**03**
	(b)	Determine the reaction at B for the propped cantilever beam shown in **Fig. 7** Use Castigliano's second theorem.	**04**
	(c)	Determine deflection at B and slope at C for a cantilever beam shown in **Fig. 8** take EI = 10 x 10^4 kN.m^2 Use unit load method	**07**
Q.4	**(a)**	For cantilever of span *'l'* draw ILD for support reaction and shear force and bending moment at center.	**03**
	(b)	Two wheel loads 14 kN and 22 kN with fixed distance 2 m between them and 14 kN load leading, crosses a beam of span 8 m from left to right. Draw ILD for SF and BM for a point 3 m from left support and find maximum values of SF and BM.	**04**
	(c)	A propped cantilever beam is having 10 m span. Draw ILD for SF at section 4 m from the fixed end.	**07**
		OR	
Q.4	**(a)**	State and explain Muller Breslau principle for influence line.	**03**
	(b)	A simply supported beam AB has span 6m. Draw influence lines for	**04**

R_A, R_B, Vx and Mx for a section X at 2m from left hand support.

(c) Draw ILD for SF and BM at section D, 4 m from A, for a two span continuous beam as shown in **Fig. 9** **07**

Q.5 **(a)** State the characteristics of stiffness metrix. **03**

(b) Differentiate between Flexibility method and Stiffness method. **04**

(c) Analyze the beam ABC fixed at A and supported on rollers at B and C as shown in **Fig. 10.** Use flexibility method. **07**

OR

Q.5 **(a)** State the characteristics of flexibility metrix. **03**

(b) Formulate flexibility matrix for the actions for a beam shown in **Fig. 11.** **04**

(c) Calculate the stiffness matrix and load vector for the structure as shown in **Fig. 12** Take EI = constant. Also calculate joint displacements and draw BMD. **07**

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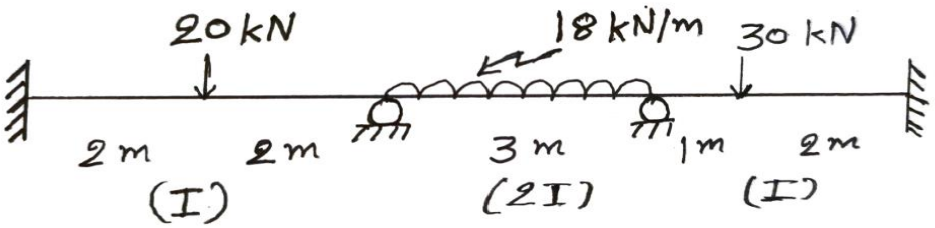

Fig.-1

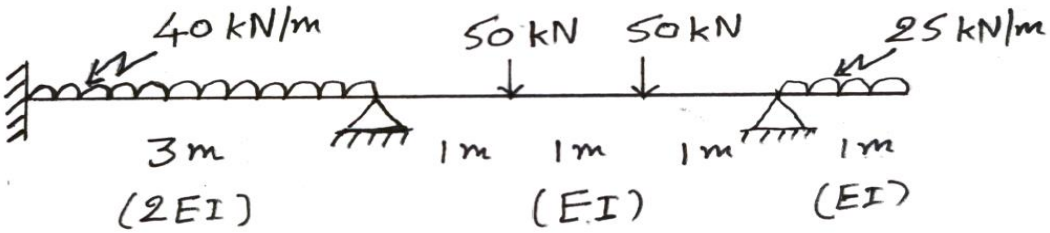

Fig.-2

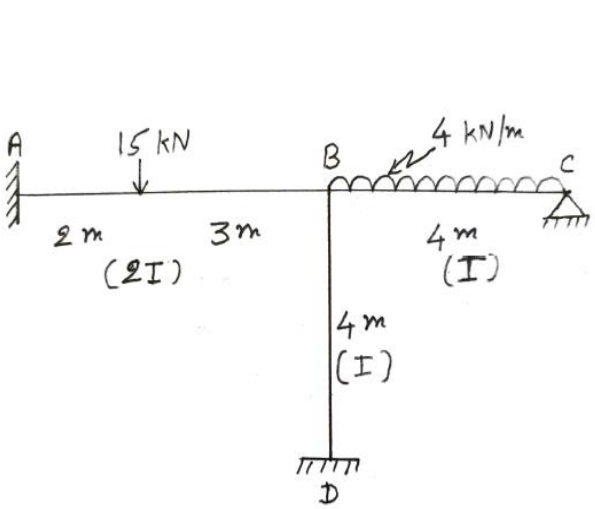

Fig.-3

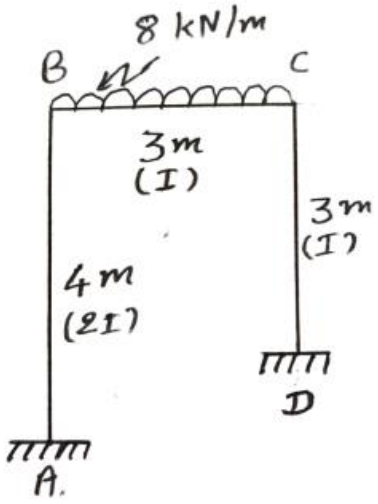

Fig.-4

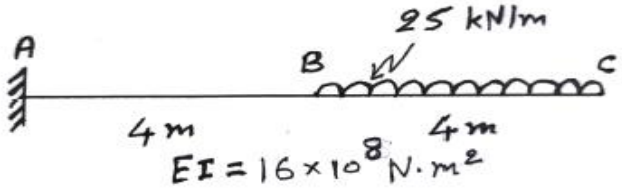

Fig-5

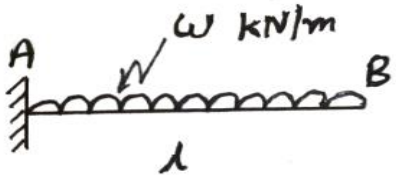

Fig.-6

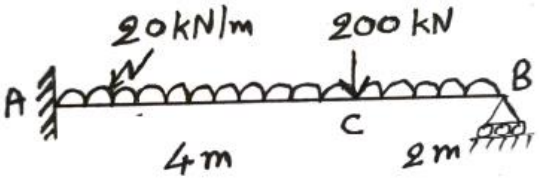

Fig.-7

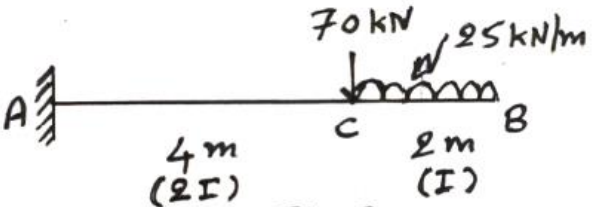

Fig-8

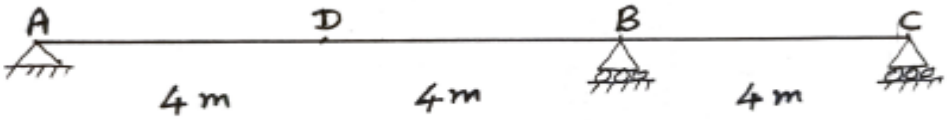

Fig.-9

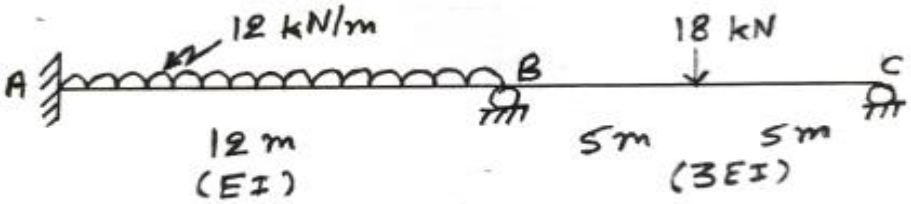

Fig.-10

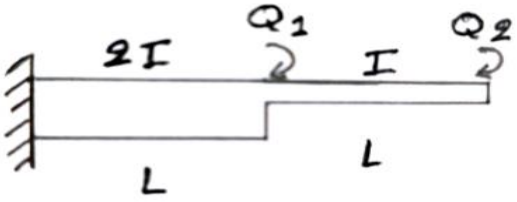

Fig.-11

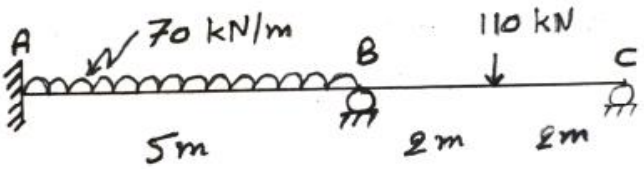

Fig.-12

Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V(NEW) EXAMINATION – SUMMER 2022

Subject Code:3150614 Date:13/06/2022

Subject Name:Structural analysis-II

Time:02:30 PM TO 05:00 PM Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	Define thinfluence line diagram and give statement of Muller Breslau principle.	**03**
	(b)	Derive slope and deflection method equations from first fundamentals.	**04**
	(c)	Determine reactions at the support and draw S.F. and B.M. diagram for a beam shown in Fig.1. Use Castigliano's theorem.	**07**
Q.2	**(a)**	Write assumptions made in slope deflection method.	**03**
	(b)	Define: Carry over moment, Distribution factor, Carryover factor,	**04**
	(c)	Draw B.M. and S.F. diagram for a beam shown in Fig.2 using Slope and deflection method.	**07**
		OR	
	(c)	Draw B.M. and S.F. diagram for a beam shown in Fig.2 using the Moment distribution method.	**07**
Q.3	**(a)**	Define: Sway. What are the causes for Sway in portal frames?	**03**
	(b)	Enlist steps of unit load method to analyse indeterminate structures.	**04**
	(c)	Analyse the frame shown in Fig.3 using the moment distribution method.	**07**
		OR	
Q.3	**(a)**	Explain Castigliano's both theorems.	**03**
	(b)	Draw qualitative shapes of influence lines for reactions in two bay- two storeyed fixed based portal frame.	**04**
	(c)	Determine the horizontal deflection at A of truss as shown in Fig.4. Use unit load method.	**07**
Q.4	**(a)**	Draw "Restrained Structure" and "Released structure" for a propped cantilever beam.	**03**
	(b)	Explain characteristics of influence line diagram for statically indeterminate structures.	**04**
	(c)	Draw the influence line for reactions Va, Vb, and Vc for the two span continuous beam having span AB = 8m and BC = 4m.Compute ordinates at 2 m interval.	**07**
		OR	
Q.4	**(a)**	Explain various types of skeletal Structures.	**03**
	(b)	Explain essential features of stiffness method.	**04**
	(c)	Analyse L-bent shown in Fig.5 using flexibility method.	**07**
Q.5	**(a)**	Define Stiffness. Derive relation between stiffness and flexibility.	**03**
	(b)	A simply supported beam AB has span 8 m. Draw influence line for Ra, Rb, Vx and Mx for a section at 3m from left hand support.	**04**
	(c)	Analyse the beam shown in Fig.6 by flexibility method.	**07**

OR

Q.5	**(a)**	Differentiate: Stiffness method and Flexibility method. Which method is suitable for general computer programming? Why?	**03**
	(b)	What is Qualitative influence line and Quantitative influence line?	**04**
	(c)	Analyse the beam shown in Fig.6 by stiffness method.	**07**

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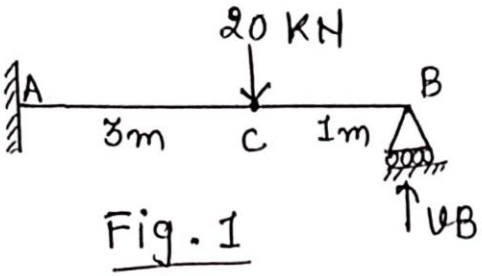

Fig. 1

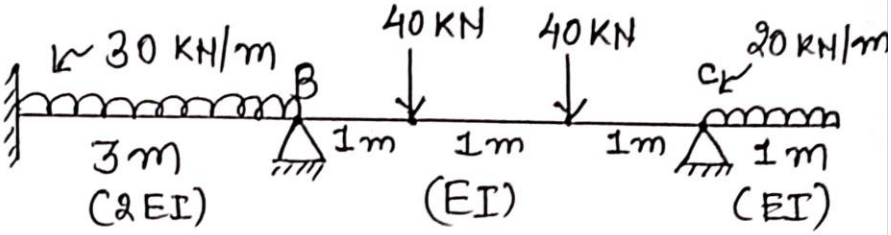

Fig. 2.

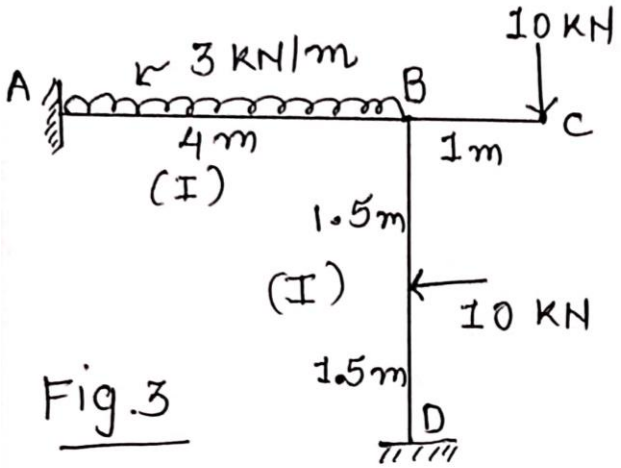

Fig. 3

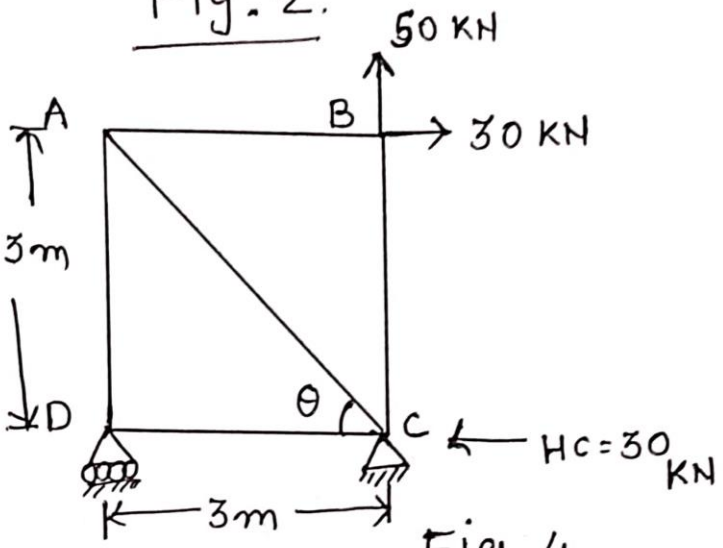

Fig. 4

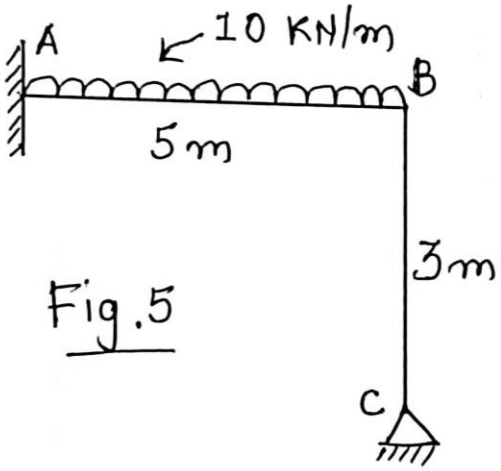

Fig. 5

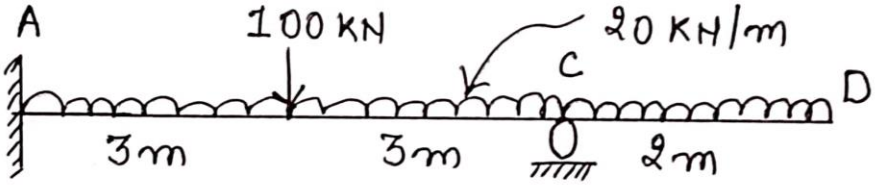

Fig. 6