

**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     |
|------------|--|-----------|
| <b>Q.1</b> | (a) Define (a) Distribution Factor (b) Carry over moment (c) Influence line  | <b>03</b> |
|            | (b) Explain (a) Castigliano's first Theorem (b) Flexibility  | <b>04</b> |
|            | (c) Derive Slope Deflection Equation using fundamentals with usual notations.  | <b>07</b> |
| <b>Q.2</b> | (a) Explain Muller Breslau principle with appropriate sketches.  | <b>03</b> |
|            | (b) Write Characteristics of stiffness matrix.   | <b>04</b> |
|            | (c) Using Castigliano's first theorem calculate deflection at free end of cantilever beam shown in Figure.1.<br>Take $E = 2 \times 10^5 \text{ N/mm}^2$ and size of beam as 230x300 mm   | <b>07</b> |
| <b>OR</b>  |  |           |
|            | (c) Determine Reaction $R_A$ and $R_B$ for the propped cantilever beam shown in the Figure. 2 using Castigliano's second theorem.  | <b>07</b> |
| <b>Q.3</b> | (a) Write Slope deflection Equation for the beam shown in figure 3.  | <b>03</b> |
|            | (b) Analyze the beam shown in figure 3 using slope deflection method and draw bending moment diagram only.   | <b>04</b> |
|            | (c) Analyze the frame shown in the figure 4 using slope deflection method and draw bending moment diagram only.  | <b>07</b> |
| <b>OR</b>  |  |           |
| <b>Q.3</b> | (a) Differentiate between stiffness and flexibility method   | <b>03</b> |
|            | (b) Discuss causes of sidesway in analysis of frame.   | <b>04</b> |
|            | (c) Analyze the beam shown in the figure 3 using moment distribution method and draw bending moment diagram.   | <b>07</b> |
| <b>Q.4</b> | (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. | <b>03</b> |
|            | (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.   | <b>04</b> |
|            | (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.               | <b>07</b> |
| <b>OR</b>  |  |           |
| <b>Q.4</b> | (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.   | <b>07</b> |
|            | (b) Draw influence line for reaction at B ( $R_B$ ) for the 14 mt long two-span beam shown in figure 8. Calculate ordinate at 2 mt interval.   | <b>07</b> |
| <b>Q.5</b> | (a) Find flexibility matrix only for the beam shown in figure 9 considering $M_A$ and $M_B$ as redundant.  | <b>07</b> |

- (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 in 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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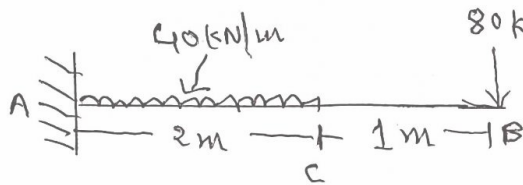


Fig-1 Q-2(c)

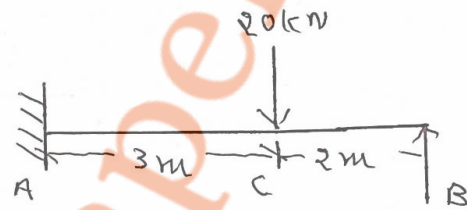


Fig-2 Q-2(c) OR

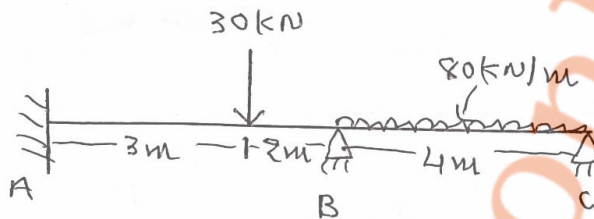


Fig-3

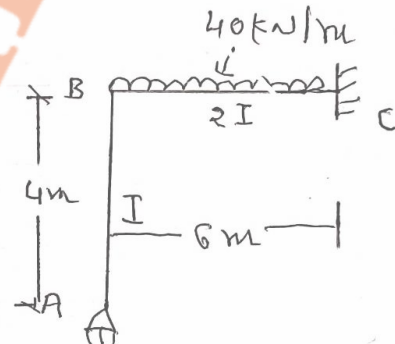


Fig-4 Q-3(c)

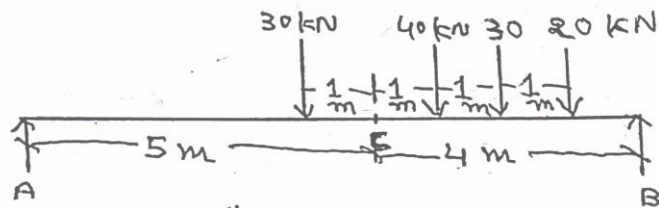


fig-5 Q-4(c)(b)

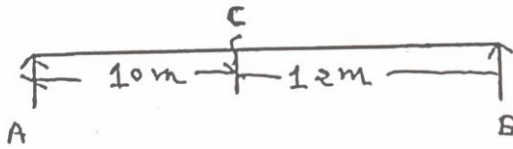
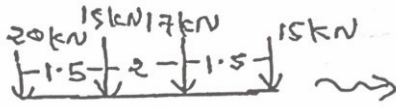


fig-6 Q-4(c)(c)

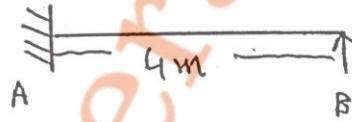


fig-7 Q-4(c)(d)

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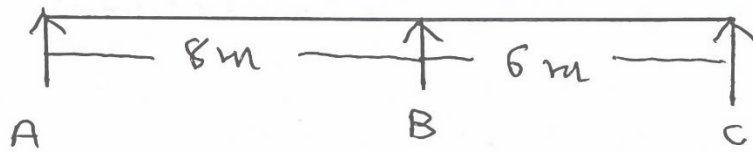


fig-8 Q-4(b) 08

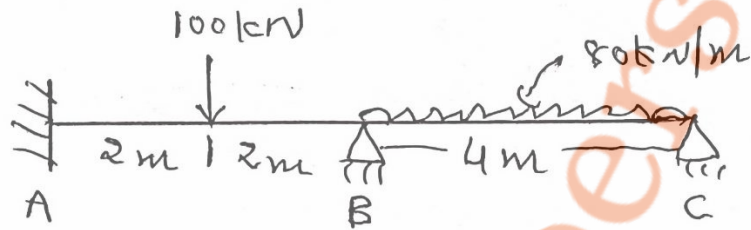


fig-9 Q-5(a)

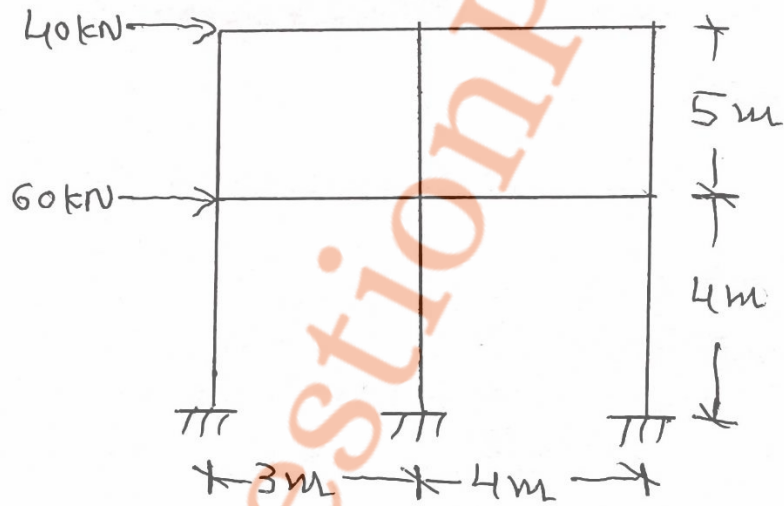


fig-10 Q-5(c) 08