Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V (NEW) - EXAMINATION – SUMMER 2017

Subject Code: 2150608 **Date: 03/05/2017**

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.**

Q -1 Answer following in Brief **14**

1 Define: Strain Energy. Write the expression for strain energy due to flexure.

2 State Castigliano's 1st Theorem. What is the use of this theorem?

3 Define: Distribution Factor. What is the value of sum of all distribution factors at the joint?

4 Enlist various types of Skeletal structures.

5 Define: Influence line diagram. Where is it used?

6 State Castiglino's 2nd Theorem. What is the use of this theorem?

7 Explain the term "Carry-over factor". Write its values for different far end support conditions.

8 Define Stiffness. What are the units of stiffness?

9 Define Flexibility. What are the units of flexibility?

10 Explain the position of loads for evaluating "absolute maximum bending moment" for the beam by Influence Lines Diagram.

11 Why the flexibility method is not suitable for computer programming?

12 What are the causes for Sway in portal frames?

13 How sway correction factor is found for analysis of portal frame by moment distribution method?

14 Draw "Restrained Structure" and "Released structure" for a propped cantilever beam.

Q-2 (a) A propped cantilever beam AB of 4m span is fixed at left end A and hinged at right end B. Find the vertical reaction at support B (V_B), if it is subjected to a UDL of 40 kN/m on whole span. Use Castigliano's 2nd Theorem. **03**

(b) Using unit load method, calculate the deflection at free end B for a cantilever beam AB having length 6m and loaded by a UDL of 30 kN/m over whole span. (EI = Constant). **04**

(c) Using Castigliano's 1st theorem, calculate the deflection at point C for the beam shown in Figure – 1. **07**

OR

(c) Using Castigliano's 2nd theorem, find the vertical reaction at point C for the frame shown in Figure – 2. Also and draw BMD. Take EI=Constant. **07**

Q.3	**(a)**	Find the distribution factors for all the members connected at point "O" as shown in Figure – 3.	**03**
	(b)	Analyse the beam shown in Figure – 4 by Moment Distribution method. Also draw the Bending Moment Diagram. Take EI=constant.	**04**
	(c)	Analyse the beam shown in Figure – 5 by Slope-Deflection method and draw BMD. Take EI=constant.	**07**

OR

Q.3	**(a)**	Write only the slope deflection equations for the portal frame as shown in Figure – 2. (Neglect Sway).	**03**
	(b)	Analyse the beam shown in Figure – 4 by Slope-Deflection method and draw BMD. Take EI=constant.	**04**
	(c)	Analyse the beam shown in Figure – 5 by Moment Distribution method and draw BMD. Take EI=constant.	**07**

Q.4	**(a)**	State and explain the Muller-Breslau's Principle.	**03**
	(b)	Draw qualitative Influence line diagrams for support reactions R_A, R_B and R_C for two span continuous beam ABC having both equal spans = L.	**04**
	(c)	Three point loads 40 kN, 60 kN and 80 kN equally spaced 1m respectively, cross a girder of 20 m span from left to right, with the 80 kN load as leading load. Calculate maximum shear force (positive and negative), and bending moment at a section 5m from left end.	**07**

OR

Q.4	**(a)**	Construct Influence Line Diagrams for Reaction (R_A) and Moment (M_A) for a cantilever beam AB fixed at A and having span L.	**03**
	(b)	For a simply supported beam AB of span 8m, draw Influence Line Diagrams for Support reactions (R_A and R_B), Shear Force and Bending Moment at a section 2m from left support.	**04**
	(c)	For a propped cantilever beam AB, fixed at A and having roller support at B, of span 6m, draw ILD for RB. Calculate ordinates of ILD at every 1m interval.	**07**

Q.5	**(a)**	Differentiate between stiffness and Flexibility methods.	**03**
	(b)	A propped cantilever beam AB of 4m span is fixed at left end A and hinged at right end B is subjected to a UDL of 40 kN/m on whole span. Taking vertical reaction R_B, as redundant, analyze the beam using Flexibility method.	**04**
	(c)	Analyse the beam shown in Figure – 5 by Stiffness method and draw BMD. Take EI=constant.	**07**

OR

Q.5	**(a)**	Enlist the properties of Stiffness matrix.	**03**
	(b)	Write only the Stiffness matrix [S] for the portal frame shown in Figure – 6. (Take AE and EI = Constant).	**04**
	(c)	Find redundant reactions at supports (R_B and R_C) for the beam shown in Figure – 5 by Flexibility method. Take EI=constant. (Take R_B as Q_1 and R_C as Q_2 as redundant).	**07**

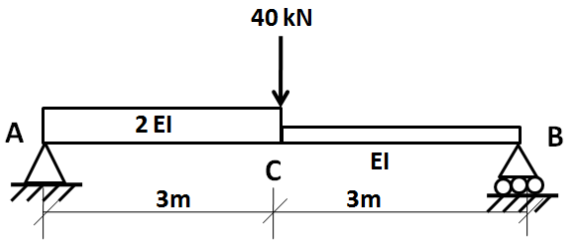

Figure – 1

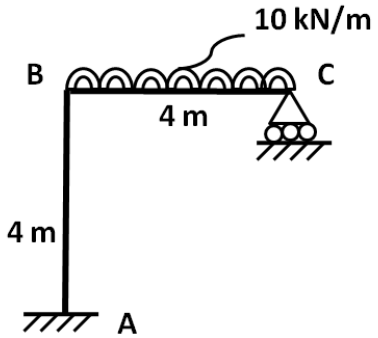

Figure – 2

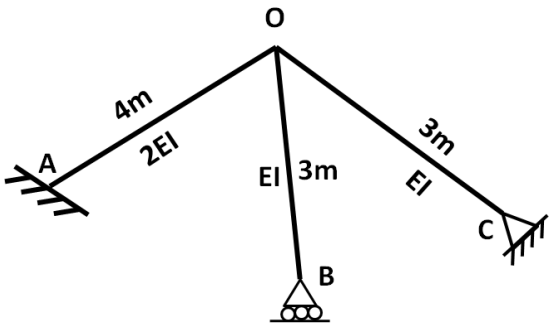

Figure - 3

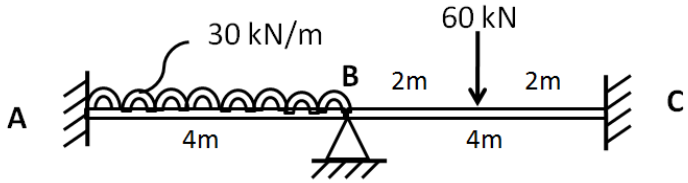

Figure – 4

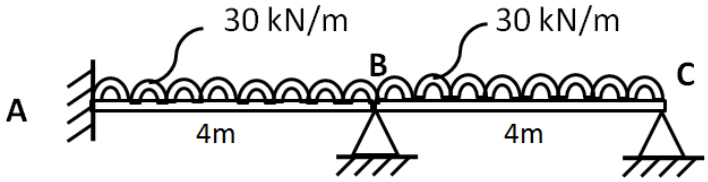

Figure – 5

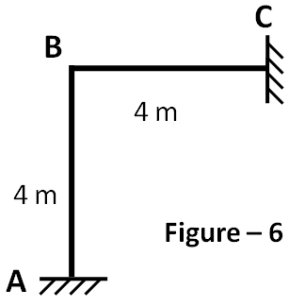

Figure – 6