GUJARAT TECHNOLOGICAL UNIVERSITY
Bachelor of Engineering - SEMESTER - V EXAMINATION - SUMMER 2025

Subject Code: 3150614　　　　　　　　　　　　　　　　**Date: 20-05-2025**

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.

|		**Marks**
Q.1	**(a)** Draw restrained structure and released structure for a propped cantilever beam.	**03**
	(b) Derive relation between stiffness and flexibility.	**04**
	(c) Analyze the continuous beam shown in **Figure** by slope deflection method and draw bending moment diagram.	**07**
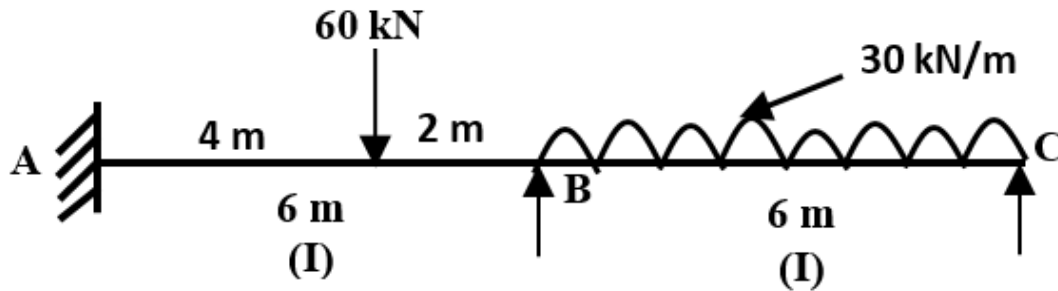
|		
Q.2	**(a)** Write characteristics of stiffness matrix.	**03**
	(b) Enlist steps of unit load method to analyze indeterminate structures.	**04**
	(c) A distributed load of 80 kN per metre run away occupy any position on the girder as shown in **Figure.** Find the maximum positive and negative shear force at the section marked C.	**07**
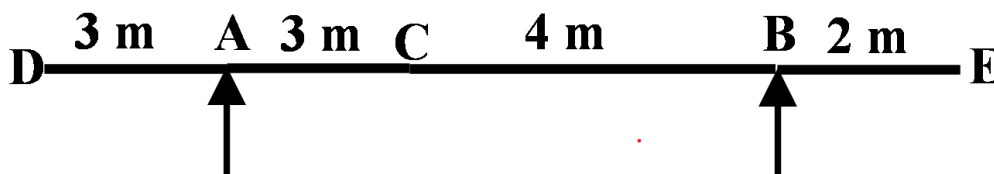
OR

(c) Analyze the frame shown in **Figure** by moment distribution method and draw bending moment diagram. **07**
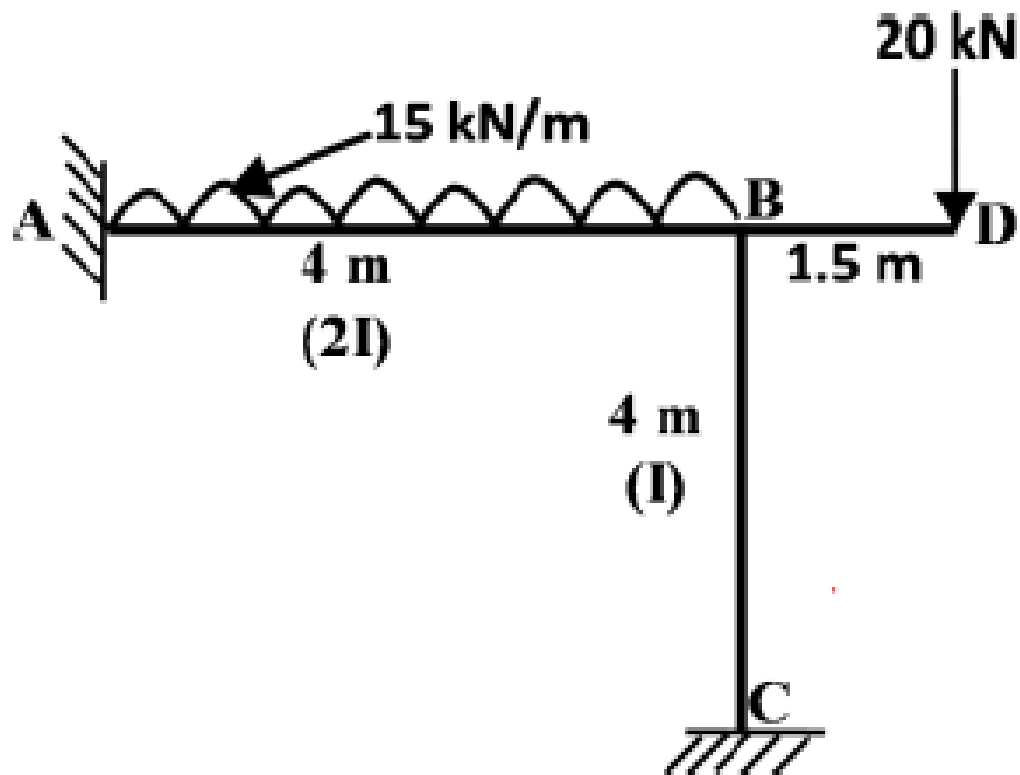

Q.3 (a) Explain fictitious load method used to solve deflection problems. **03**

(b) Calculate the central deflection for a simply supported beam of length 'l' subjected to a udl 'w' throughout its span using Castingliano's 1st theorem. **04**

(c) Draw the influence line diagram for reaction at B in the continuous beam shown in **Figure**. EI is constant throughout. **07**
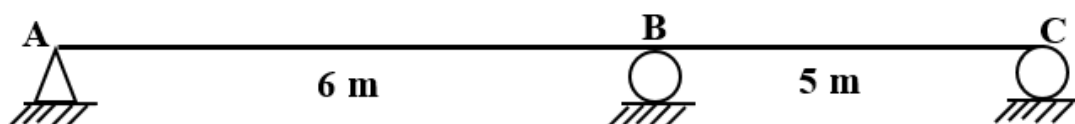

OR

(a) For a cantilever beam, show that stiffness and flexibility matrices are reciprocal to each other. **03**

(b) Derive shear equation in the case of analyzing the portal frame with side sway. **04**

**(c)** Calculate the fixed end moment for the beam shown in **Figure** using Castigliano's 2nd theorem. **07**
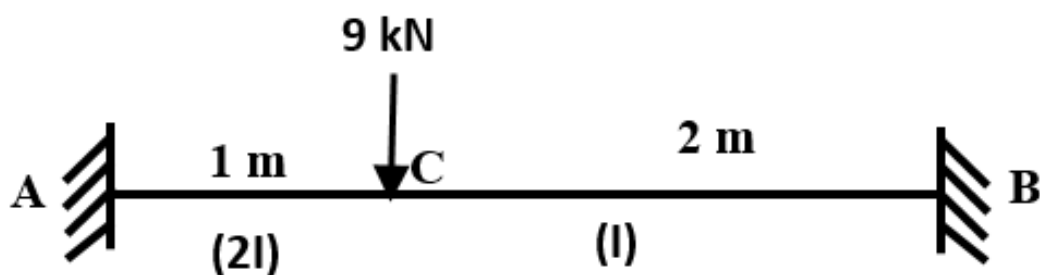
Q.4 **(a)** Explain various types of skeletal structures. 03

(b) State and prove the Castingliano's 1st theorem. 04

(c) For a mild steel bent of 200 mm diameter as shown in **Figure**, find the vertical deflection at D. $E = 2 \times 10^5$ N/mm^2. 07
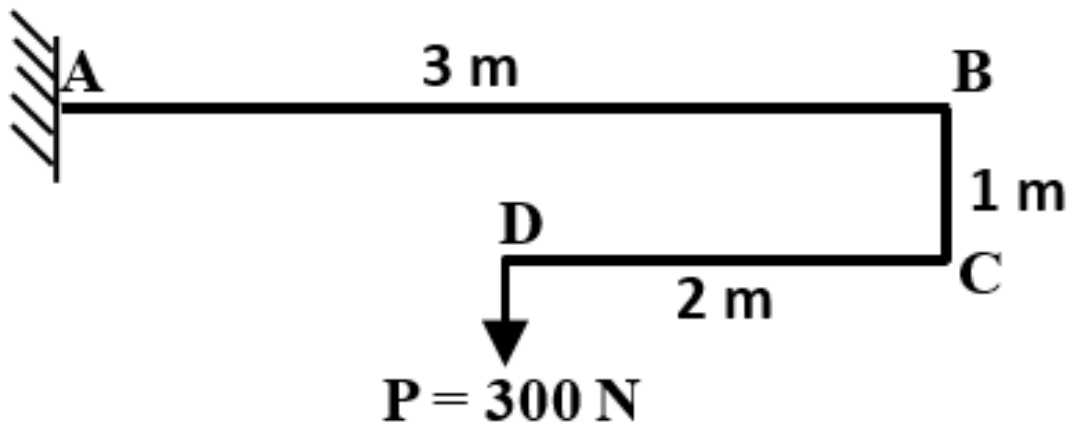

OR

(a) What is influence line diagram? What is the use of it? 03

(b) Draw influence line diagrams for support reactions of a simply supported beam. 04

(c) A steel bar bent to the shape as shown in **Figure** is fixed at A and carries a vertical load W at C. Calculate the vertical deflection at C. EI is constant throughout 07

C

W

R

90 deg.

O

B

L

A
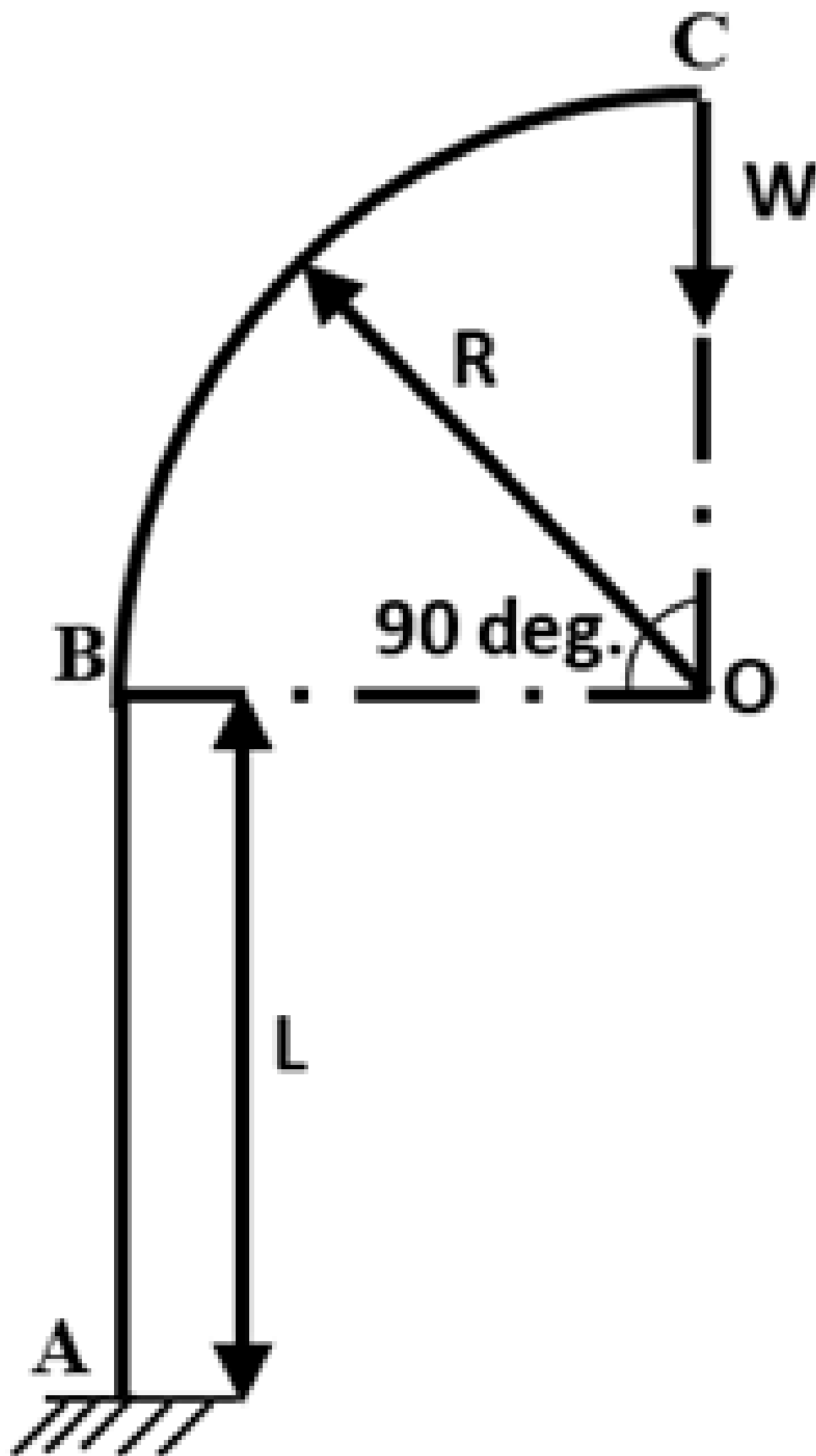
Q.5 (a) Differentiate between Stiffness method and Flexibility method. Which method is suitable for general computer programming? **03**

(b) What is a portal frame? Discuss the causes of sway in a portal frame. **04**

(c) For a beam shown in **Figure,** find the moments and the reactions at the supports. Draw bending moment and shear force diagram for the beam. **07**
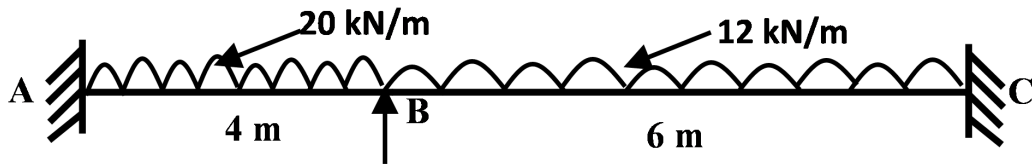
OR

(a) State the assumptions made in deriving slope-deflection equations. **03**

(b) Explain Muller-Breslau principle. **04**

(c) Analyze the beam shown in **Figure** by flexibility method. **07**

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