

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-V (NEW) EXAMINATION – SUMMER 2019

Subject Code: 2154001

Date: 31/05/2019

Subject Name: Advanced Structural Analysis

Time: 02:30 PM TO 05:00 PM

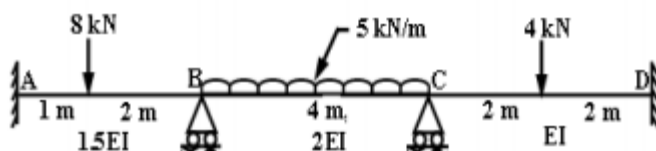
Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

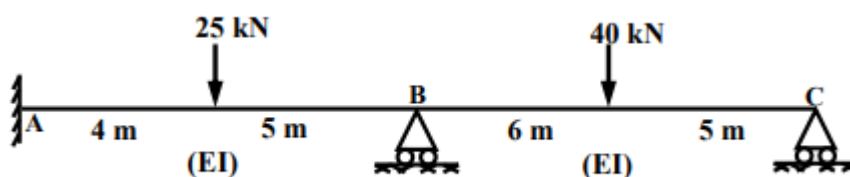
MARKS

- Q.1 (a) While applying the moment distribution method, a designer remembers that “nothing comes back from the fixed end”. Justify. **03**
- (b) What is the importance of ILD in structural analysis? **04**
- (c) For a two span simply support continuous beam ABC having AB=5m and BC=5m, calculate the ILD ordinates for R_A at every 1m interval. **07**
- Q.2 (a) What are the basic stages in Moment distribution method? **03**
- (b) A propped cantilever beam of span 7m has fixed support at left end and roller support at right end is loaded by a UDL of 25kN/m up to 3m from left support. Analyze the beam by energy principle and draw BMD. **04**
- (c) Analyze the beam shown below by Moment Distribution Method and draw BMD. **07**

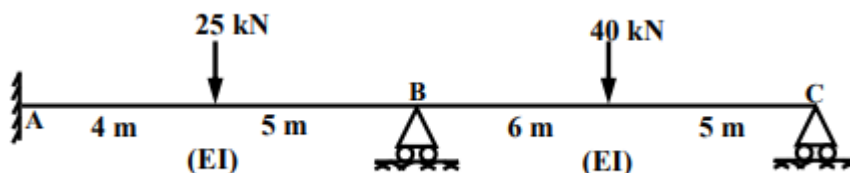


OR

- (c) A two span simple support continuous beam ABC having AB=5 m and BC = 6m. The span AB is loaded by a point load at centre by 50kN and span BC is loaded by a UDL of 20kN/m over entire span. Analyze the beam by moment distribution method and draw BMD. **07**
- Q.3 (a) Define: Stiffness, Distribution Factor, Carry Over Factor **03**
- (b) Find distribution factors for the beam shown below. **04**

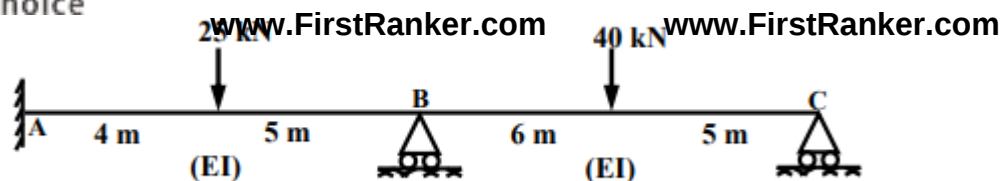


- (c) Analyze the beam shown below by Displacement Method. **07**

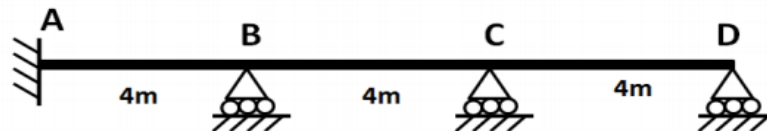


OR

- Q.3 (a) Explain Castigliano's both theorems. **03**
- (b) Calculate deflection at B for a cantilever beam AB, fixed at A and free at B, and is acted upon by a UDL of 45 kN/m over whole span using unit load method. Take EI =constant. Consider length of AB=3m. **04**
- (c) Analyze the beam shown below by Force Method. **07**

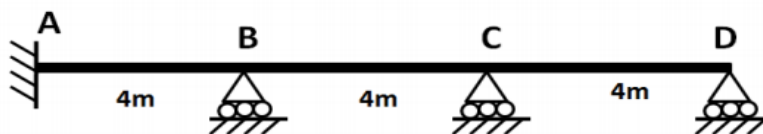


- Q.4 (a) Give the properties of flexibility and stiffness matrix. 03
 (b) What is meant by the focus and epicentre of an earthquake? Name the two kinds of body waves and explain how they differ. 04
 (c) Derive the Flexibility Matrix [F] for the beam shown below, assuming vertical reactions at supports B, C and D as redundant. 07



OR

- Q.4 (a) Write a stiffness matrix/ flexibility matrix for 4 DoF system. 03
 (b) Differentiate between stiffness method and flexibility method. 04
 (c) Derive the Stiffness matrix [S] for the beam shown below. 07



- Q.5 (a) Explain four virtues of an earthquake resistant design. 03
 (b) Calculate deflection at B for a cantilever beam AB, fixed at A and free at B, and is acted upon by a UDL of 45 kN/m over whole span using unit load method. Take $EI = \text{constant}$. Consider length of $AB = 3\text{m}$ 04
 (c) A five storeyed building has size of $30\text{m} \times 30\text{m}$. It is located in Bhuj and resting on hard soil. The weights of floors and height of the floors are 2000kN, 2500kN, 2500kN, 2500kN and 2100kN AND 4.5m, 3.5m, 3.5m, 3.5m and 3.5m respectively from slab no.1 from bottom. Assuming the building as special moment resisting office building, calculate the horizontal shear forces acting at the each slab level by equivalent lateral force method. 07

OR

- Q.5 (a) Explain the plate tectonic theory and its mechanism. 03
 (b) What is earthquake? How do human activities induce earthquake? 04
 (c) A Five storey hospital building having special moment resisting frame (SMRF) located in Gandhinagar on medium soil with following data: 07
 (i) No. of bay in x and y-direction = 6
 (ii) Width of each bay = 6m
 (iii) Thickness of slab = 150 mm
 (iv) Storey height = 8 m
 (v) Size of beam and column = 300 mm x 450 mm
 (vi) Live load = 60 kN/m^2
 Calculate Seismic Weight of the Building, Natural Period of Building, Base shear of building, Distribution of base shear as per IS 1893:2002. (Assume any additional data if required and neglect the weight of the infill wall panels.)
