

Mid-West University  
**Examinations Management Office**

End Semester Examinations 2081

Bachelor level/ B.E. Civil/ 4<sup>th</sup> Semester

Full Marks: 50

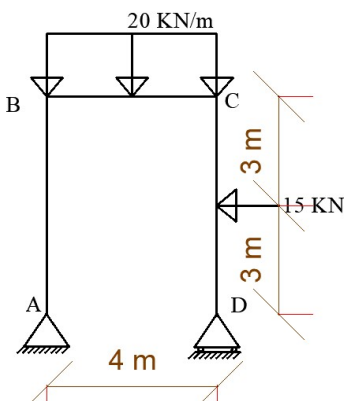
Time: 3 hours

Pass Marks: 25

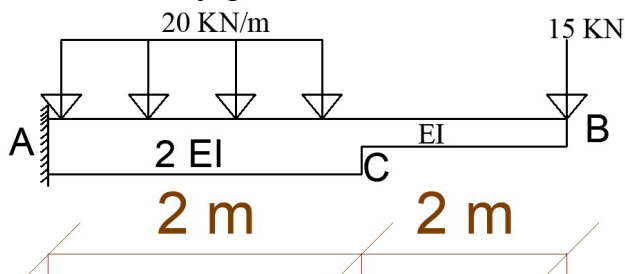
**Subject: Theory of Structure (CE441/CE209)**

- Attempt all the questions
- Figures in the margin indicate full marks.
- Assume suitable values, with a stipulation, if necessary.
- Candidates are required to answer the questions in their own words as far as possible.

1. Differentiate between linear and non-linear behavior of structure and explain their uses in the theory of structure [4+2]
2. What do you mean by Strain energy and complementary strain? Derive an expression for strain energy due to shear. [4]
3. A bar of 3cm in diameter and length of 130cm is supported rigidly in a vertical position at the top and is provided with a hollow falling mass and a collar at the bottom which supports a spring 12cm long. Find the stress developed if a falling mass is 7kg and it falls from the height of 1.15m measured from the collar top. Take  $g = 9.81 \text{ m/s}^2$ , stiffness of spring ( $k$ ) = 40 kN/m and  $E = 210 \text{ GN/m}^2$ . [4]
4. Determine the horizontal deflection and rotation at roller support in the given frame. Take flexural rigidity  $EI$  is constant throughout [4]

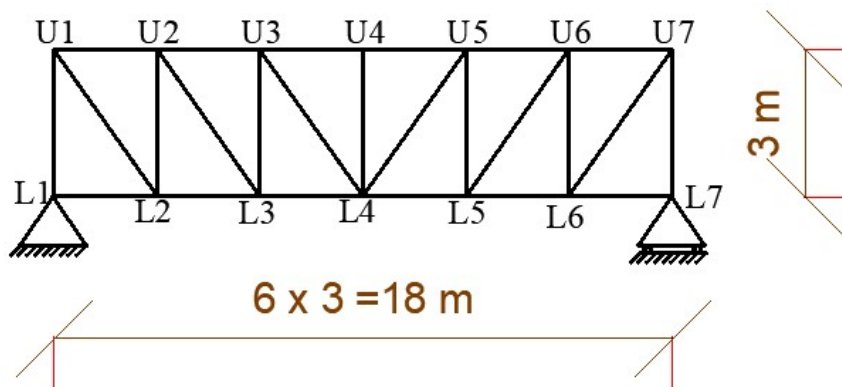


5. Determine the slope and deflection at B and C in the given beam using the moment area method and conjugate beam method [8]



6. A bridge of 20 m long and a train of five wheel load 130 kN, 120 kN, 180 kN, 90 kN, 90 kN at center to center distance of 2.5 m, 2 m, 1.5m and 1 m respectively. 130 kN load is leading load. Determine maximum bending moment and shear force at distance of 8 m from left support. [5]

7. Draw the influence line diagram for forces in the members U3L4, U3U4 and U3L3 of the given truss. [5]



8. A three hinged parabolic arch has a span of 160m and a rise of 25m. A uniformly distributed load of intensity 30KN/m of length 60m rolls over the arch from left to the right. Using the influence line diagram, find the maximum bending moment at a section 50m from the right support. Also find normal thrust and radial shear at the section corresponding to the maximum bending moment. [8]
9. A suspension bridge of 150 m span has two three-hinged stiffening girders supported by two cables having a central dip of 15 m the roadway has a width of 7.5 m. The dead load on a bridge is 8 KN/m<sup>2</sup> while the live load is 12 KN/m<sup>2</sup> which acts on the left half of the span. Determine the shear force and bending moment in the girder at 30 m from the left end. Find also maximum tension in the cable position of the live load. [6]

**The End**