

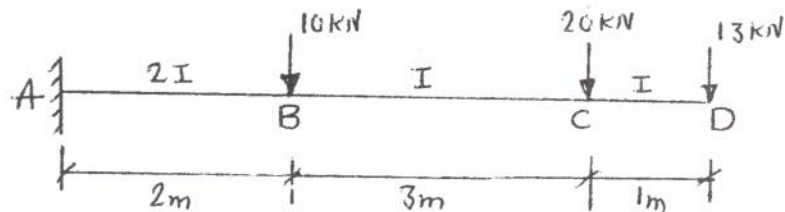


VEERMATA JIJABAI TECHNOLOGICAL INSTITUTE
[Central Technological Institute, Maharashtra State]
Matunga, Mumbai-400 019

SEMESTER EXAMINATION *April / May 2014* DATE OF EXAM *30/04/2014*
SEMESTER & PROGRAM *IV Sem- SY BTech Civil* TIME *1:30 PM - 4:30 PM*
TIME ALLOWED *3 HRS.* MARKS *100*
COURSE (Course Code) : *SE0224 Structural Analysis-I*

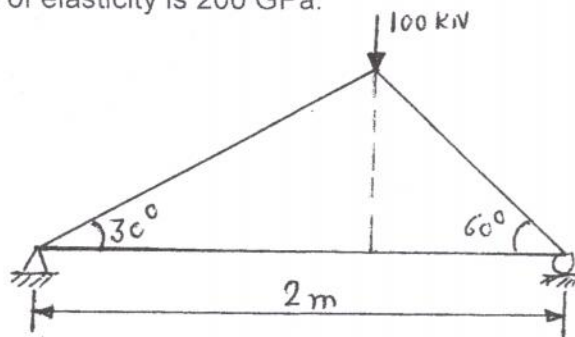
- Instructions
1. All questions are compulsory
 2. Figures to the right indicate full marks.
 3. Assume suitable data if necessary and state it clearly.

- Q.1 a. Derive the expression for the strain energy due to bending. 10
b. Determine the slope and deflection at free end D and at point B of 10
cantilever beam loaded as shown in figure. Take $E=2E5$ MPa and $I= 5E8$
 mm^4 . (Use moment area method)

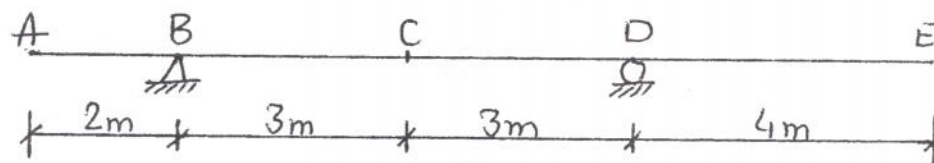


OR

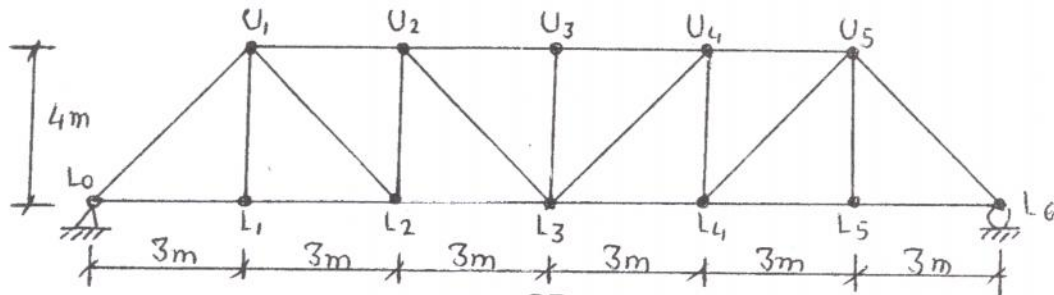
- Determine the vertical and horizontal deflection of joint C for the truss 10
shown in figure. The cross-sectional area of all members is $10E-4$ m² and
modulus of elasticity is 200 GPa.



- Q.2 a. For the beam as shown in figure, construct the influence line diagram for a) 08
the reaction at support B, b) the moment at point C, c) the reaction at
support D and d) shear just to the left of point D.



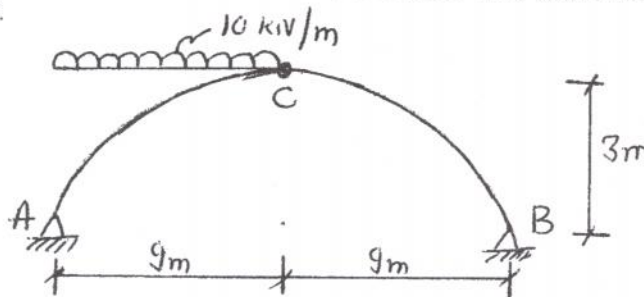
- b. Construct the influence line diagrams for forces in members U_1-L_1 , U_2-L_2 , L_1-L_2 and U_1-L_2 of the truss as shown in figure. Further, calculate the maximum axial force in member U_1-L_1 when a UDL of 30 kN/m and 8 m long crosses the girder on bottom chord. 12



OR

Derive the expression for bending moment and draw the influence line diagram for the bending moment at a section X-X situated at a distance a from the left support of three hinged arch. 12

- Q.3 a. State the assumptions made in Euler theory of column. Further, derive the expression for critical load for columns with both ends hinged. 10
- b. A rectangular column of wood 3 m long carries a load of 300 kN . Determine whether or not a section of size $200 \text{ mm} \times 150 \text{ mm}$ will be able to carry this load if a factor of safety of 3.0 is to be used assuming Euler's formula is applicable. Take $E=12.5 \text{ GPa}$ and the permissible stress is 12.0 MPa . If the section will not be able to carry this load, design the square section to do so. (Assume both ends are pinned supported) 10
- 0.4 a. A three-hinged parabolic arch of span L subjected to UDL through the entire span. Prove that the arch is not subjected to any bending moment at any section. 06
- b. Derive the expression for normal thrust and radial shear at a section x from the left support of three-hinged simply supported arch. 04
- c. A three-hinged parabolic arch is loaded and supported as shown in figure. Determine the normal thrust and radial shear at a distance 4.0 m from the left support. 10



- Q.5 a. Derive the expression for length of suspension cable supported at same level from the ground. 08
- b. A bridge cable between two piers 80.0 m apart and central dip 8.0 m carries a load of 30 kN/m of entire span. Determine the maximum tension in the cable. 12

Determine the tension in the back stay and the force transmitted to the piers if the cable passes over saddles and back stay is inclined at 60° to the vertical. And, if cable passes over the pulley, determine the horizontal and vertical force transmitted to the supporting piers when the inclination is same.
