VEERMATA JIJABAI TECHNOLOGICAL INSTITUTE

[Central Technological Institute, Maharashtra State]

Matunga, Mumbai-400 019

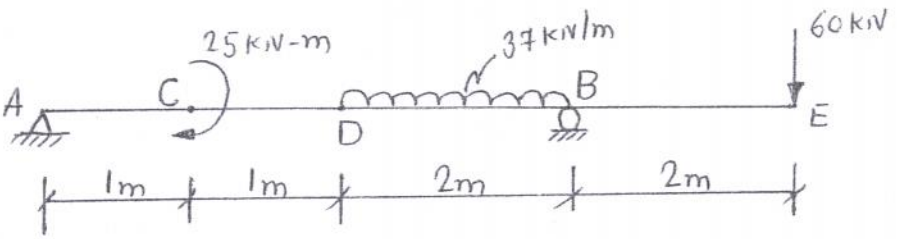
Re-Exam

SEMESTER EXAMINATION	May 2014	DATE OF EXAM	22/05/2014
SEMESTER & PROGRAM	*IV Sem- SY BTech Civil*	TIME	1.30PM - 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.

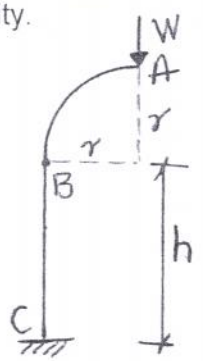
Q.1 a. State and explain the Maxwell's reciprocal theorem. 08

b. Determine the slope and deflection at point D and E for the beam loaded as shown in figure. Take E=200 GPa and I= 6.2E7 mm^4. (Use Double Integration Method) 12

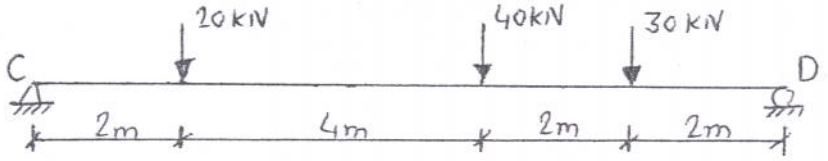


OR

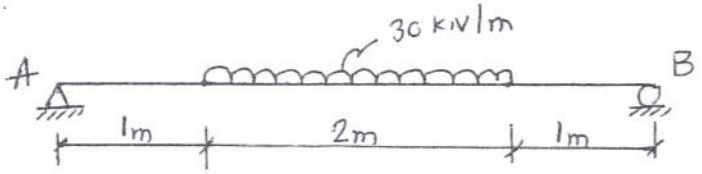
Using Castigliano's method, determine the vertical and horizontal deflection at point A for the lamp post loaded and supported as shown in figure. Assume uniform flexural rigidity. 12



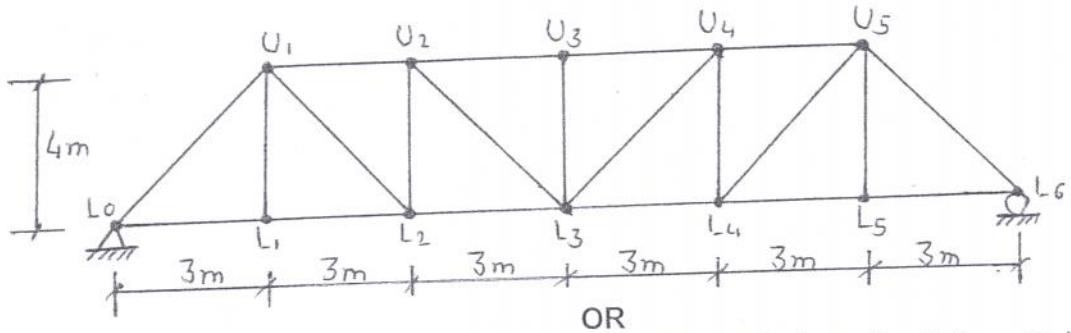
Q.2 a. A simply supported beam CD is loaded as shown in figure. Determine the shear force at 5 m from support C by using influence line diagram. 04



A beam AB of span 4 m is simply supported at the both ends. It is loaded with UDL as shown in figure, Determine the reactions using influence line diagram. 04



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 suspension bridge. 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 fixed. 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 mm X 150 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 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 semi-circular arch of radius R carries a UDL of w per unit run over the whole span. Determine the horizontal thrust and maximum bending moment for the arch. 10

Q.5 a. Derive the expression for length of suspension cable supported at same level from the ground. 08

b. A suspension bridge of 100 m span has two three hinged stiffening griders supported by two cables with a central dip of 10.0 m. If three point loads of 20 kN each are placed along the centre line of the roadway at 10 m, 15 m and 20 m from the left hand hinge, determine the shear force and bending moment in each girder at 30.0 m from each end. Also, calculate the maximum and minimum tension in the cable. 12

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