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06CV43

Fourth Semester B.E. Degree Examination, June/July 08
Structural Analysis - I

Time: 3 hrs. Max. Marks:100

Note : ***Answer any FIVE full questions, choosing at least two questions from each part.***

Part - A

1 a. Explain degree of freedom, static and kinematic indeterminacy with an example. **(06 Marks)**

b. Determine the magnitude and nature of forces in all the members of the pin – jointed plane truss shown in fig Q 1 (b) by method of joints.

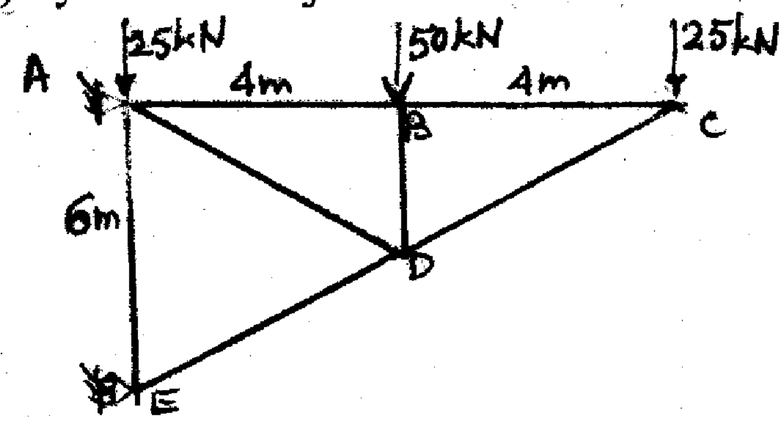

Fig Q 1 (b) **(14 Marks)**

2 a. Find slope and deflection at free end of cantilever beam shown in fig Q 2 (a) by moment area method.

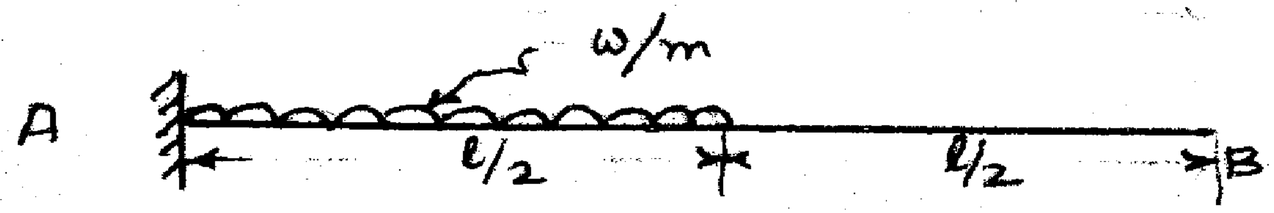

Fig Q 2 (a) **(10 Marks)**

b. Calculate deflection at loaded point and slopes at A and B and maximum slope for the beam shown in fig Q 2 (b) by conjugate beam method. Assume E = 200 GPa $I = 50{,}000\ cm^4$

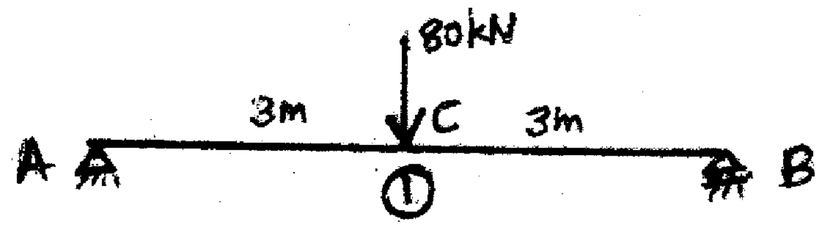

Fig Q 2 (b) **(10 Marks)**

3 a. State i) Castigliano's first and second theorem ii) Maxwell's reciprocal theorem. **(08 Marks)**

b. Determine horizontal and vertical components of deflection at point A for the frame loaded as shown in fig Q 3 (b) by strain energy method.

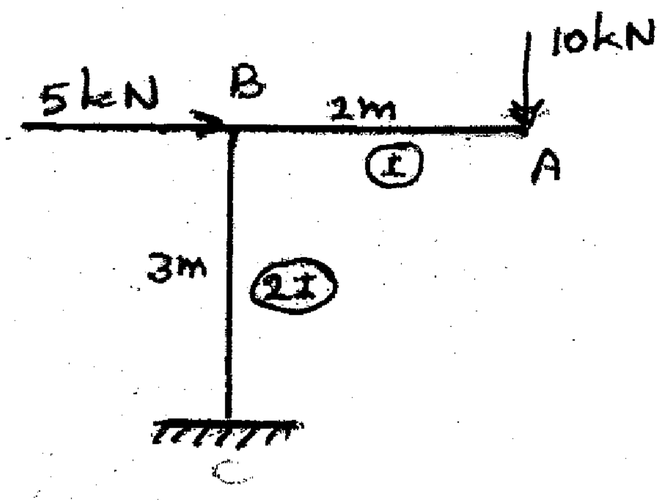

Fig Q 3 (b) **(12 Marks)**

4 a. Write short notes on strain energy due to i) Axial force ii) Due to bending **(08 Marks)**

b. Determine the deflection and rotation at the free end of the cantilever beam shown in fig Q 4 (b). Given $E = 2 \times 10^5\ N/mm^2$ and $I = 12 \times 10^6\ mm^4$ by unit load method.

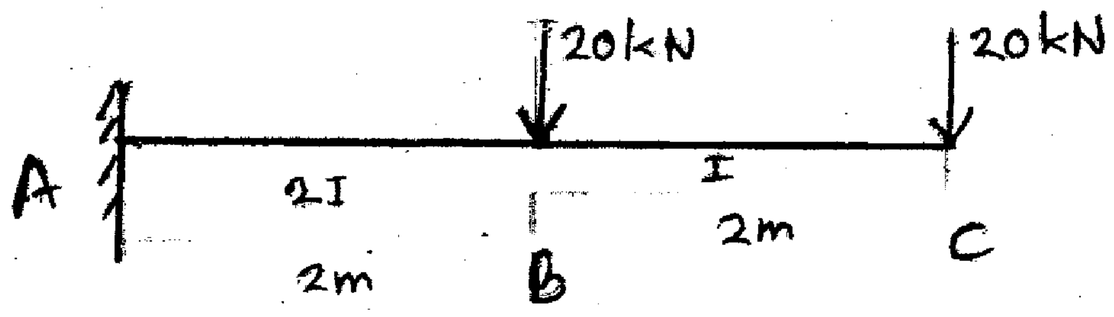

Fig Q 4 (b) **(12 Marks)**

Part - B

5 a. A suspension cable having supports at the same level has a span of 30 m and a maximum dip of 3 m. The cable is loaded with a udl of 10 kN/m throughout its length. Find from first principle the maximum tension in the cable. **(08 Marks)**

b. A three hinged parabolic arch hinged at the supports and at the crown has a span of 24 m and a central rise of 4 m. It carries concentrated load of 50 kN at 18 m from left support and uniformly distributed load of 30 kN/m over the left half portion. Determine the bending moment, normal thrust an radial shear at a section 6 m from the left support. Sketch BMD. **(12 Marks)**

6 a. Determine the fixed end moment of a beam shown in fig Q 6 (a) by CD method. Also sketch BMD and SFD.

Fig Q 6 (a) **(10 Marks)**

b. Analyse the propped cantilever beam shown in fig Q 6 (b) by consistant deformation method. Also sketch BMD and SFD.

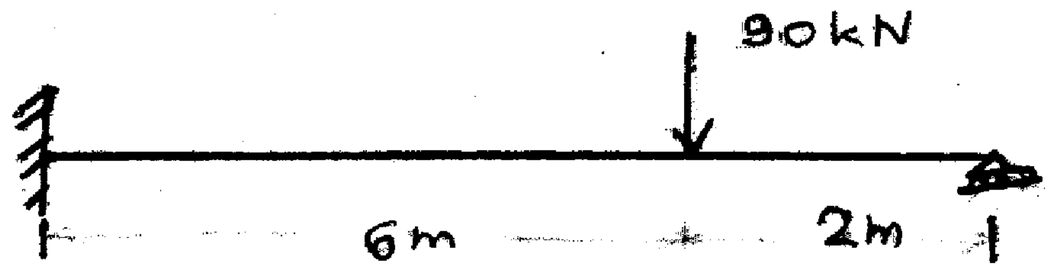

Fig 6 (b) **(10 Marks)**

7 Analyse the two span continuous beam shown in fig Q 7 using three moment equation.

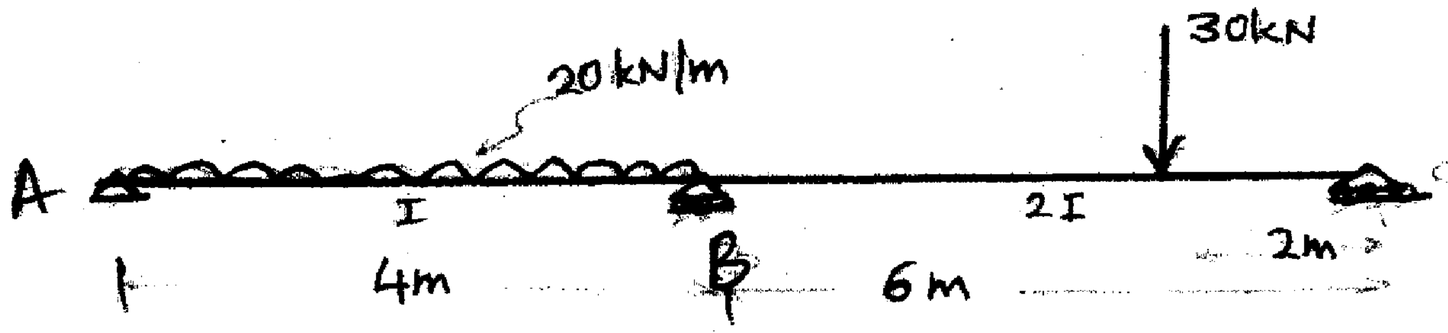

Fig Q 7 **(20 Marks)**

8 A parabolic arch, hinged at the ends has a span 30 m and rise 5 m. A concentrated load of 12 kN acts at 10 m from the left hinge. The second moment of area varies as the secant of the slope of the rib axis. Calculate the horizontal thrust and the reactions at the hinges. Also calculate the maximum bending moment any where on the arch. **(20 Marks)**

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