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15CV42

Fourth Semester B.E. Degree Examination, Jan./Feb. 2023
Analysis of Determinate Structures

Time: 3 hrs.   Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. State the assumption made in the analysis of truss. **(06 Marks)**
   b. A 9mt span truss is loaded as shown in Fig Q1(b). Find the forces in the members CD, CG and HG by using method of sections.
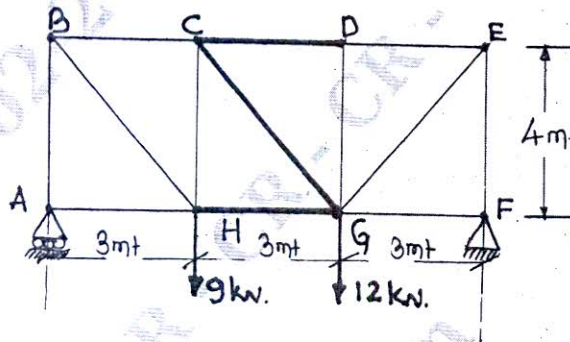

Fig Q1(b) **(08 Marks)**

   c. Define Degree of freedom. **(02 Marks)**

OR

2 A Truss shown in Fig Q2. Find the forces in all the members of the truss and tabulate the Results, by using method of joints.
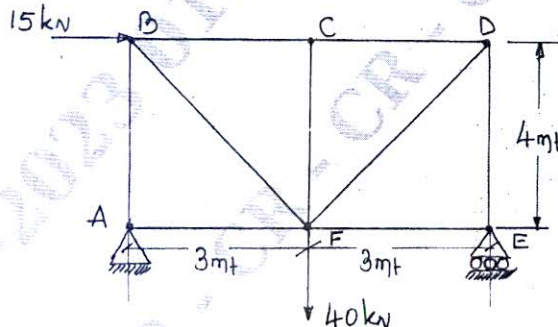

Fig Q2 **(16 Marks)**

Module-2

3 a. Determine the slope and Deflection of the free end of a cantilever beam subjected to single concentrated load 'W' at free end, by using double integration method. **(08 Marks)**
   b. A beam of length 6mt is simply supported at its ends 'A' and 'B' as shown in Fig Q3(b). Find : Deflection under each load. Take $I = 8.5 \times 10^7 mm^4$ and $E = 2 \times 10^5 N/mm^2$, by using Macaulay's method.
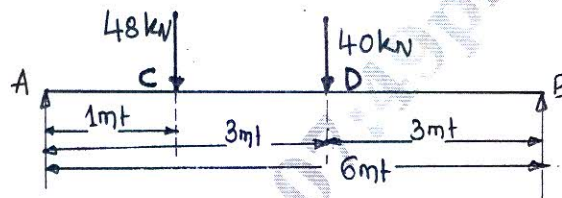
Fig Q3(b) **(08 Marks)**

OR

4 a. Determine the slope and deflection at the free end, and at point 'C' 2mt from the fixed end 'A'. For the beam shown in Fig Q4(a), by using moment area method. Take $I = 2 \times 10^8$ mm^4 and $E = 2 \times 10^5$ N/mm^2.
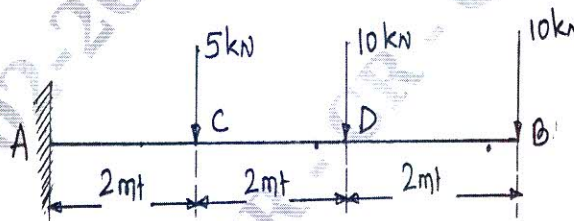

Fig Q4(a) **(08 Marks)**

  b. Using conjugate beam method. Find deflection at point 'C' and slope at point 'A' for simply supported beam shown in Fig Q4(b).
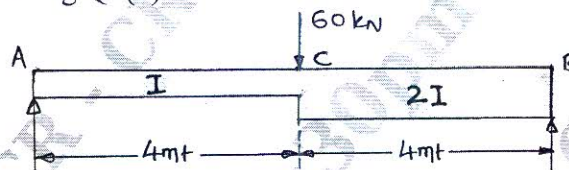

Fig Q4(b) **(08 Marks)**

Module-3

5 a. Derive an expression for the strain energy stored in a beam due to Bending. **(06 Marks)**
  b. Determine the vertical deflection at 'C' in the frame shown in Fig Q5(b). Take $E = 200 \times 10^6$ kN/m^2 and $I = 3 \times 10^7$ mm^4. Using strain energy method.
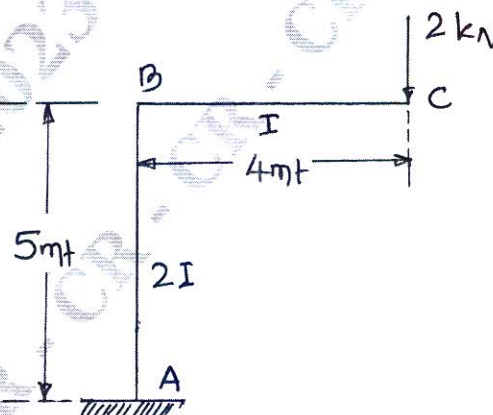

Fig Q5(b) **(10 Marks)**

OR

6 a. Find the deflection under concentrated load for the beam shown in Fig Q6(a) by using Castiglione's first theorem. Take $E = 2 \times 10^8$ kN/m^2 and $I = 14 \times 10^{-6}$ m^4.
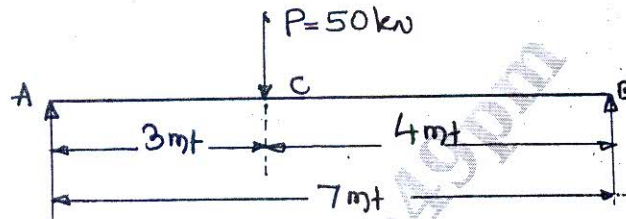
Fig Q6(a)   **(10 Marks)**

b. Derive an expression for strain energy stored in member when it is subjected to Axial load.
(06 Marks)

Module-4

7   A three hinged parabolic arch of span 20mt and rise of 5mt, carries a uniformly distributed load of 40kN/mt over the entire span and a point load of 200kN at 5mt from right and support. Determine the reactions at supports, and also determine Bending moment, Normal thrust and Radial shear at 5mt from left and support.   **(16 Marks)**

OR

8   A suspension cable having supports at same level has a span of 20mt and dip of 4mt. The cable carries uniformly distributed load of 20kN/mt over the hole span.
Find : i) Maximum Tension in the cable
     ii) Minimum Tension
     iii) The length of the cable
     iv) The size of cable of the permissible stress of cable material is $150N/mm^2$ **(16 Marks)**

Module-5

9   a. What is an influence line? And explain its importance in structural Analysis.   **(04 Marks)**
   b. A single rolling load of 50kN rolls along a girder of span 20mt as shown in Fig Q9(b). Determine the :
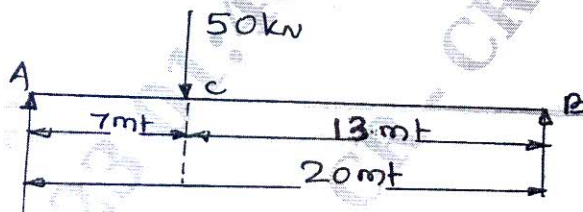i) Shear force at 'C'   ii) Maximum +Ve and –Ve force shear force   iii) Absolute Max +Ve, -Ve, SF.

Fig Q9(b)   **(12 Marks)**

OR

10   A series of wheel loads crosses over a girder of span 15mt from left to right with 40kN load leading as shown in Fig Q10. Determine :
i) Maximum Bending movement
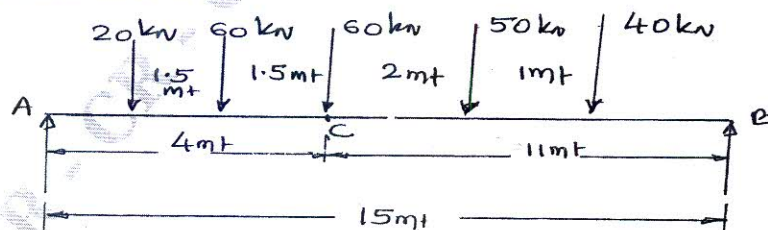ii) Maximum shear force at a section of 4mt from left support.

Fig Q10   **(16 Marks)**

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