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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Fourth Semester, B.E. - Civil Engineering

Semester End Examination; May/June - 2018

Basic Structural Analysis

Time: 3 hrs *Max. Marks: 100*

***Note**: Answer **FIVE** full questions, selecting **ONE** full question from each unit.*

UNIT - I

1a. State principle of super position and explain briefly. 4

b. Explain static indeterminacy and kinematic indeterminacy with examples. 4

c. Determine the forces on the members of the truss shown in Fig.Q.1(c) by method of joints. 12

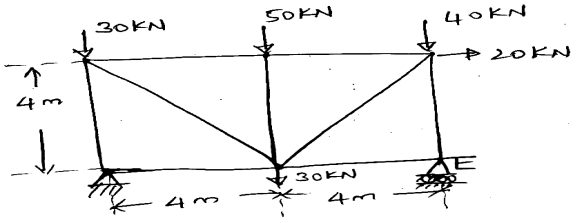

Fig Q.1(c)

2a. What are the assumptions in Euler's theory? Derive Euler's formula for buckling load of column having one end fixed and the other end free. 8

b. A hollow steel strut, 2.4 m long, is pin-jointed at the ends. It has an outer diameter of 40 mm and a thickness of 5 mm. If the yield stress is 320 N/mm^2 and E = 2 x10^5 N/mm^2, compare the crippling load given by Euler's and Rankine's formulae. Also determine *l/r* ratio for which Euler's formula applies. 12

UNIT - II

3 a. Find slopes at the ends and deflection at centre of a simply supported beam subjected to uniformly distributed load throughout the span by moment-area method. 12

b. Derive Betti's law of reciprocal work. 8

4 a. Find the deflection of the bean shown in Fig Q. 4(a) under the point load.
Take E = 210x10^6 kN/m^2, I_1 = 160x10^{-6} m^4 and I_2= 120x10^{-6} m^4. Use conjugate beam method. 10

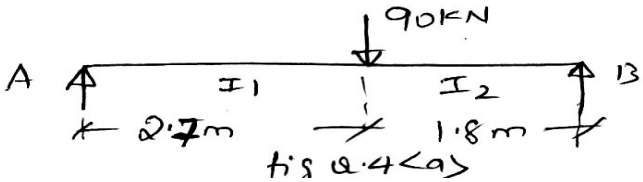

Fig Q.4(a)

b. Derive strain energy stored due to bending $U = \int_0^L \frac{M^2}{2EI}\,dx$. 10

UNIT - III

5. A suspension cable 140 m span and 14 m central dip carries a load of 1 kN/m. Calculate the maximum and minimum tension in the cable. Find the horizontal and vertical forces in each pier under the following conditions : 20

Contd…2

i) If the cable passes over a frictionless rollers on top of the piers

ii) If the cable is firmly clamped to saddles carried on frictionless rollers on top of the piers

In each case the back stay is inclined at 30º with the horizontal.

6. A parabolic arch hinged at the springing and crown has a span of 20 m. The central rise of the arch is 4 m. It is loaded with a uniformly distributed load of intensity 2 kN/m on the left 3 m length. Calculate; 20

i) The direction and magnitude of reactions at the hinges

ii) The bending moment, normal thrust and shear at 4 m and 15 m from the left end. Refer Fig. Q.6.

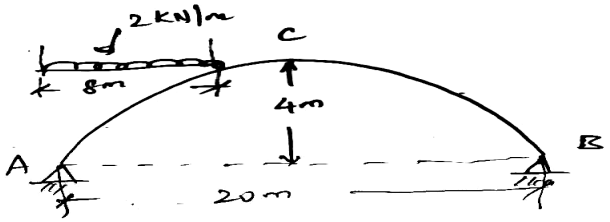

fig Q.6

UNIT - IV

7 a. A uniformly distributed load of 1 kN/m, 6 m long crosses a girder of 16 m span. Construct the maximum SF and BM diagrams and calculate the values at sections 3 m, 5 m and 8 m from the left hand support. 12

b. State the condition for maximum bending moment at a section in a simply supported beam:

i) When single concentrated load passes over it? 8

ii) Uniformly distributed load longer than the span of the beam.

8 a. What is influence line? Explain its importance in structural analysis. 4

b. The multiple point loads 100 kN, 120 kN, 80 kN and 150 kN with a spacing 2 m crosses a girder of span 28 m from left to right with 100 kN load leading. Calculate maximum bending moment and maximum shear force. 16

UNIT - V

9. Analyse the continuous beam shown in Fig. Q.9 by three moment equation and draw BMD. 20

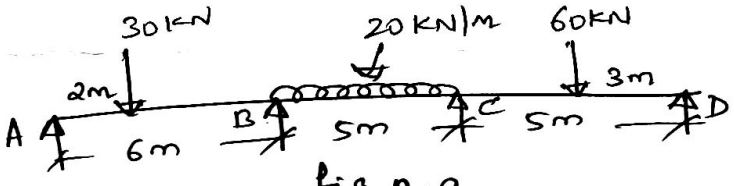

fig Q.9

10. Find the moments for a fixed beam, subjected to an eccentric point load W as shown in Fig Q.10 20

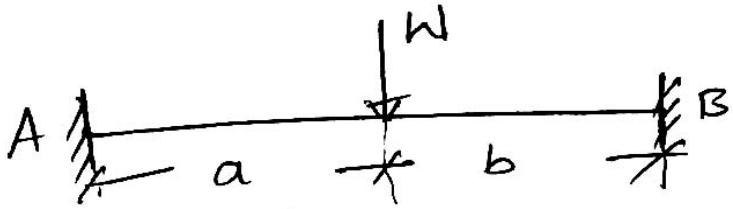

fig Q.10

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