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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 - 2019

Basic Structural Analysis

Time: 3 hrs *Max. Marks: 100*

***Note**: i) Answer **FIVE** full questions, selecting **ONE** full question from each unit.*
ii) Missing data, if any, may be suitably assumed.

UNIT - I

1 a. Differentiate between statically determinate and statically indeterminate structure. 6

b. Find the force in the member of the truss shown in Fig. Q1.b. Tabulate the results. Use method of joints. 14

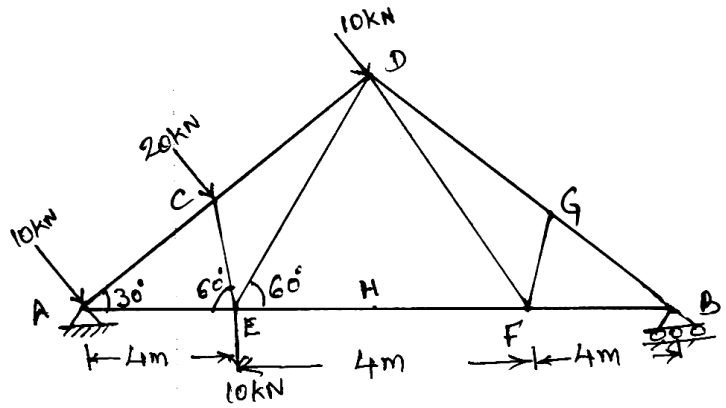

Fig Q1.b

2 a. Derive deflection equation with usual notations. 10

b. A beam of length *L* is loaded with a couple applied at an intermediate point. Calculate the slope at the ends and the deflection under the point load of the couple. (Fig. Q2.b). Take EI constant. 10

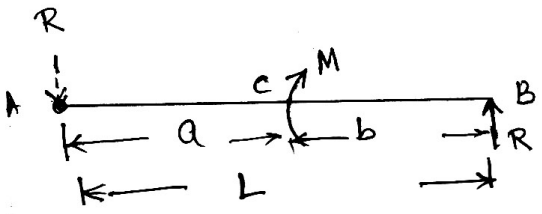

Fig Q2.b

UNIT - II

3 a. For the beam in Fig. Q3.a. Compute the rotation at support and maximum deflection by moment area method. Take I = 4×10^8 mm^4 and E = 200 GPa. 12

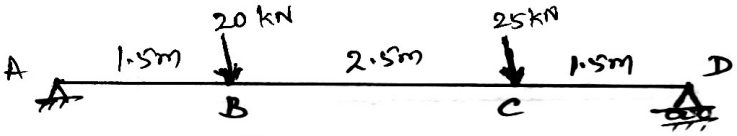

Fig Q 3a

Contd….2

b. Find the slope and deflection at the free end, by moment area method for the Fig. Q3.b shown with neat sketches. 8

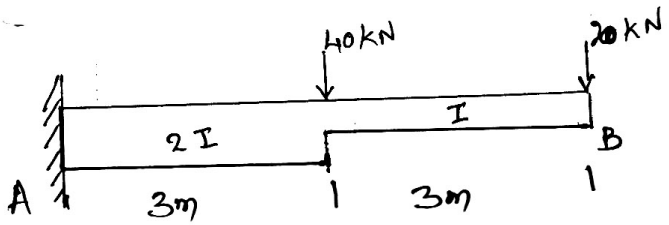

Fig Q3b

4 a. A simply supported beam of length *L* carries a load *L* of *W* per unit run over the whole span. Find the slope and deflection at the centre by conjugate beam method. Take EI as constant. 8

b. Find the midspan deflection of the beam shown in Fig. Q4.b. Using Conjugate beam method. Take E = 200 GPa, I = 200×10^{-4} m^2. 12

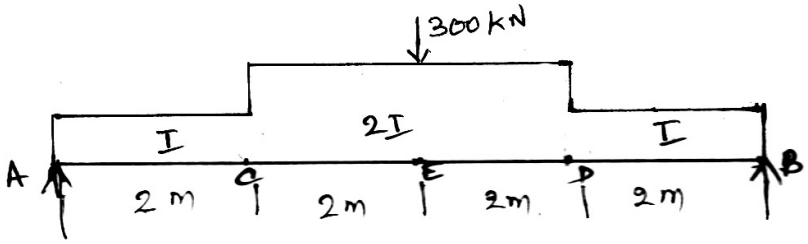

Fig Q4b.

UNIT - III

5 a. A Symmetrical unstiffened suspension cable is parabolic in shape and has a span of 300 m and a dip of 30 m. It supports an udl of 20 kN/m over the whole span. If the maximum allowable stress is 150 N/mm^2, determine the length of the cable and area of the cable. 6

b. A cable is suspended from two points *A* and *B* which are 80 m apart. *A* is 5 m below *B*. The lowest point on the cable is 10 m below *A*. The cable supported a udl of intensity 20 kN/m over the entire span. Compute the; 14

i) Reaction at supports ii) Maximum tension in the cable

6 a. A three hinge parabolic arch has a span of 20 m and central rise of 5 m. It carries a concentrated load of 100 kN at a distance of 5 m from the left support. Determine the maximum bending moment and plot the BMD. 10

b. A three hinged parabolic arch of 36 m span and central rise of 6 m carry a udl of 30 kN/m to the left half of the span and a 60 kN point load at 9 m from the right support. Determine the normal thrust, radial shear and BM at quarter span from left support. 10

Contd….3

UNIT - IV

7 a. Two wheel loads of 160 kN (leading loads) and 400 kN spaced 2 m apart move on a simply supported beam girder of span 16 m from left to right. Find the maximum positive and negative shear force at a section; 10

i) 4 m from the left end ii) 6 m from left end

b. A UDL of intensity 2 kN/m and 5 m long crosses simply supported beam 20 m span from left to right calculate; 10

i) Maximum shear force and Maximum bending moment at a section 8 m from the left support

ii) Absolute maximum bending moment

8 a. State and prove Castigliano's first theorem. 10

b. A simply supported beam of span 20 m carries a concentrated load 10 kN at a distance 8 m from left end support. Using Castigliano's method, determine the deflection under the load. Assume EI constant. 10

UNIT - V

9 a. Detemine the reaction components in propped cantilever shown Fig. Q9.a. EI is constant. Use consistent deformation method. 10

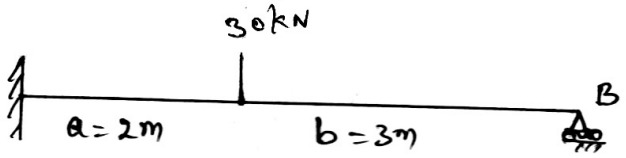

Fig Q 9 a

b. Using consistent deformation method, determine the reaction component in the beam shown in Fig. Q9.b. EI constant. 10

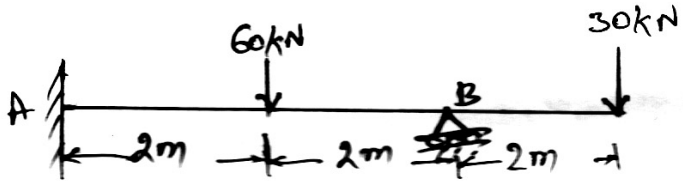

Fig Q 9 b

10. With neat sketch, derive three moment equation. 20

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