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10CV43

Fourth Semester B.E. Degree Examination, Dec.2019/Jan.2020

Structural Analysis - I

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

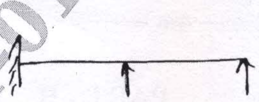
Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

PART - A

1 a. Define the following :
i) Statically determinate and indeterminate structures. **(06 Marks)**
ii) Linear and non linear systems iii) Geometric and material non – linearity.

b. Find the statical and kinematic indeterminacy for the following structures. **(04 Marks)**

i)



ii)

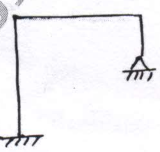


Fig.Q1(b)

c. Derive the expression for strain energy in an elastic member due to bending. **(10 Marks)**

2 a. Find the maximum slope and maximum deflection for the beam shown in fig.Q2(a) by Conjugate beam method. Take $EI = 10.2 \times 10^3$ kN m^2. **(10 Marks)**

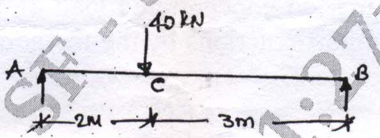


Fig.Q2(a)

b. Calculate the slope and deflection at the free end for the Cantilever beam shown in fig. Q2(b) by Moment Area method. Take $EI = 6 \times 10^3$ kN m^2. **(10 Marks)**

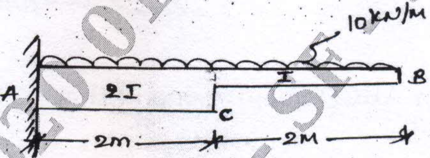


Fig.Q2(b)

3 a. State Clarke – Maxwell's theorem of reciprocal deflection. **(02 Marks)**

b. A simply supported beam of span 'L' carries a concentrated load 'P' at a distance of 'a' from left hand side support as shown in fig. Q3(b). Using Castiglione's theorem , determine the deflection under the load. Assume uniform flexural rigidity. **(10 Marks)**

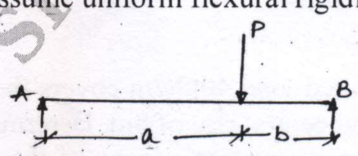


Fig.Q3(b)

c. Determine the vertical deflection at the free end for the overhanging beam shown in fig. Q3(c). Assume constant EI. Use Castiglione's method. **(08 Marks)**

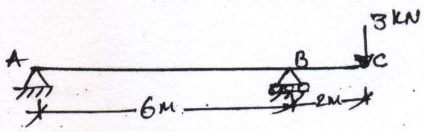


Fig.Q3(c)

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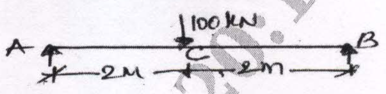
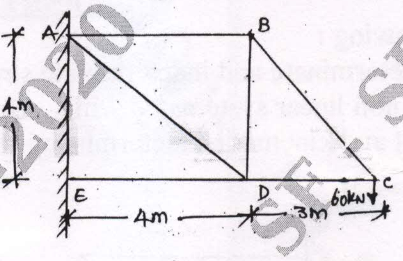
4 a. Determine the deflection at 'c' for the beam shown in fig. Q4(a) by Strain Energy method. **(06 Marks)**

Fig.Q4(a)



b. Determine the vertical deflection at D for the frame loaded as shown in fig.Q4(b) by using Unit Load method. The cross sectional areas of members AD and DE are 1500 mm^2 while those of other members are 1000mm^2. Take E = 200kN/mm^2. **(14 Marks)**

Fig.Q4(b)

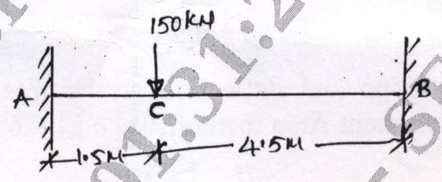


PART - B

5 A three hinged parabolic arch hinged at the supports and at the crown has a span of 24m and a central rise of 4m. It carries a concentrated load of 75kN at 18m from the left support and uniformly distributed load of 45kN/m over the left half of the portion. Determine the bending moment, normal thrust and radial shear at a section 6m from the left support. **(20 Marks)**

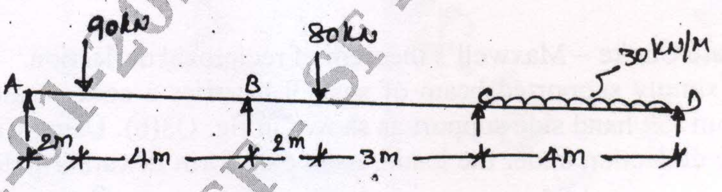
6 A fixed beam of 6m span carries a concentrated load of 150kN at a distance of 1.5m from the left support. Calculate the support reactions by the method of consistent deformation. Also draw BMD and SFD. Take EI = constant. **(20 Marks)**

Fig.Q6



7 A continuous beam ABCD simply supported at A, B, C and D is loaded at shown in fig. Q7. Draw BMD and SFD. **(20 Marks)**

Fig.Q7



8 A uniformly distributed load 40kN/m covers the left half of the span of a two hinged parabolic arch of span 36m and central rise of 8m. Determine the maximum bending moment. Assume that the moment of inertia varies as secant of the slope of the section. Neglect the effect of rib shortening. **(20 Marks)**

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