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10CV43

Fourth Semester B.E. Degree Examination, Dec.2018/Jan.2019

Structural Analysis – I

Time: 3 hrs. Max. Marks:100

Note: 1. ***Answer any FIVE full questions, selecting at least TWO questions from each part.***
2. ***Missing data may be suitably assumed.***

PART – A

1 a. Explain degree of freedom with examples. **(06 Marks)**

b. Distinguish between statically determinate and indeterminate structures with examples. **(08 Marks)**

c. Derive an expression for strain energy due to bending. **(06 Marks)**

2 a. Determine the rotation and deflection at the free end of a cantilever beam shown in Fig.Q2(a) by moment area method.

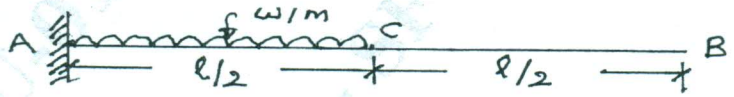

Fig.Q2(a) **(10 Marks)**

b. A horizontal girder of steel having a uniform section is 14m long and is simply supported at its ends. It carries concentrated loads of 120 kN and 80 kN at sections 3m and 4.5 m from the left end and right end respectively. Find the slope and deflection under the loads by conjugate beam method. **(10 Marks)**

3 a. Using strain energy method, determine the deflection at the free end of a cantilever beam subjected to a concentrated load p at the free end. Take length of beam $= \ell$. **(08 Marks)**

b. Determine the vertical deflection of point 'C' in the frame shown in Fig.Q3(b) by strain energy method. Given E = 200 kN/mm^2 and I = 30 × 10^6 mm^4.

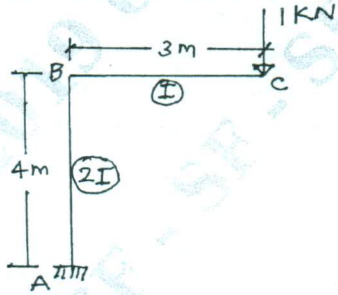

Fig.Q3(b) **(12 Marks)**

4 a. Determine the reaction at prop. for propped cantilever beam carrying udl of w/m run throughout its span using strain energy method. Take EI constant. **(08 Marks)**

b. Analyze the fixed beam shown in Fig.Q4(b) by strain energy method and draw SFD and BMD.

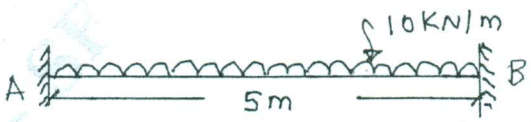

Fig.Q4(b) **(12 Marks)**

PART – B

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

b. A suspension cable having supports at same level has a span of 40 m and a maximum dip of 4m. The cable is loaded with udl of 10 kN/m throughout its length. Calculate minimum and maximum tension in the cable. Also find the length of cable. **(08 Marks)**

6 a. By consistent deformation method, analyse the cantilever beam shown in Fig.Q6(a). Draw SFD and BMD.

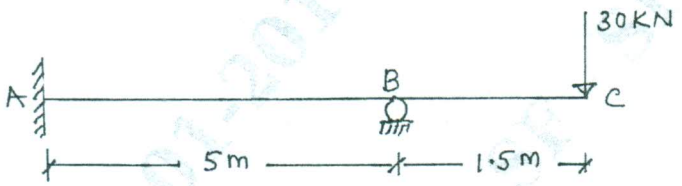

Fig.Q6(a) **(10 Marks)**

b. Find the fixed end moments for the beam shown in Fig.Q6(b) by consistent deformation method.

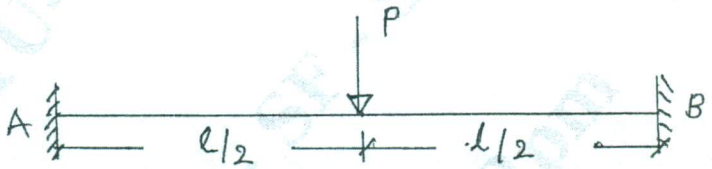

Fig.Q6(b) **(10 Marks)**

7 Determine the support moments in the continuous beam shown in Fig.Q7 by using three moment equation. Draw BMD.

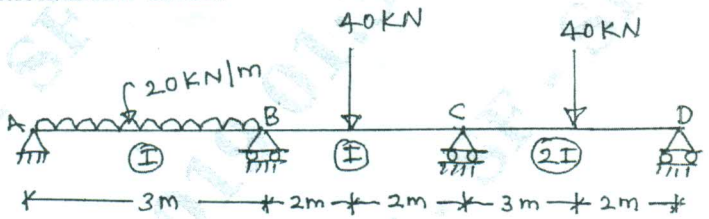

Fig.Q7 **(20 Marks)**

8 A parabolic two hinged arch has a span of 30 m and rise of 5 m. A concentrated load of 12 kN acts at 10 m from left hinge. The second moment of area varies as the secant of slope of rib axis. Calculate the horizontal thrust and normal thrust and radial shear at left hinge. **(20 Marks)**

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