



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.

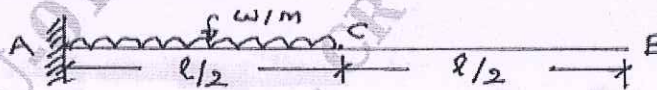


Fig.Q2(a)

(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 = l. (08 Marks)
- b. Determine the vertical deflection of point 'C' in the frame shown in Fig.Q3(b) by strain energy method. Given  $E = 200 \text{ kN/mm}^2$  and  $I = 30 \times 10^6 \text{ mm}^4$ .

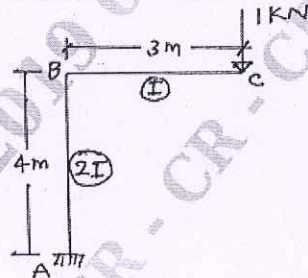


Fig.Q3(b)

(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.

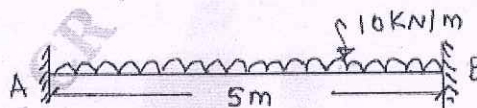


Fig.Q4(b)

(12 Marks)

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 - 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.

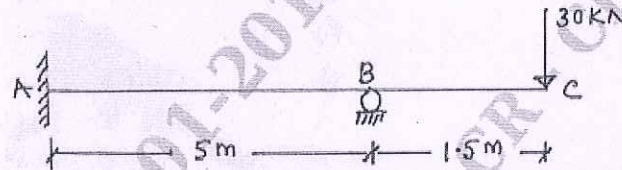


Fig.Q6(a)

(10 Marks)

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

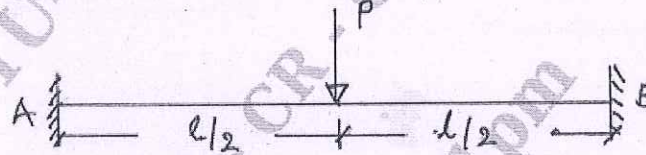


Fig.Q6(b)

(10 Marks)

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

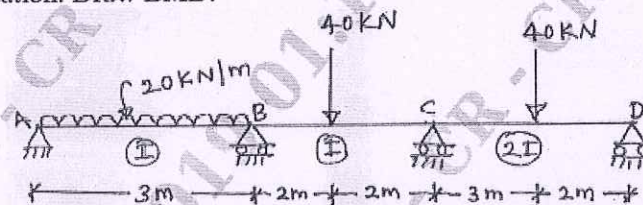


Fig.Q7

(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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