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15CT42

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

Time: 3 hrs.

Max. Marks: 80

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Missing Data may be suitably assumed.

Module-1

- 1 a. Explain degree of freedom with examples. (04 Marks)
- b. Distinguish between statically determinate and indeterminate structures with examples. (05 Marks)
- c. Analyze the pin jointed plane truss as shown in Fig Q1(c) by method of joints and hence tabulate the member forces.

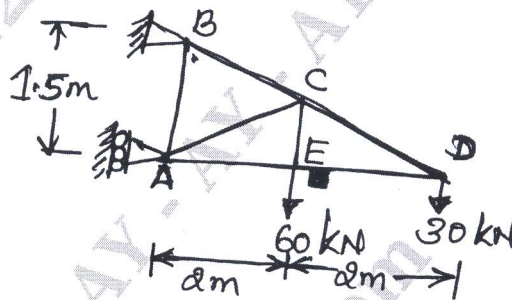


Fig Q1(c)

(07 Marks)

OR

- 2 a. Explain briefly about different types of structural forms with aid of neat sketch. (06 Marks)
- b. Determine the rotation and deflection at the free end of a cantilever beam shown in Fig Q2(b) by moment area method.

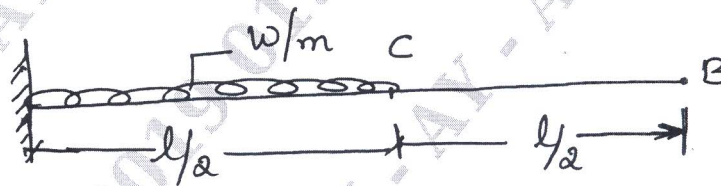


Fig Q2(b)

(10 Marks)

Module-2

- 3 a. Derive an expression for strain energy due to bending. (08 Marks)
- b. Determine the deflection at point C and slope at point A for the beam loaded as shown in Fig Q3(b) by moment area method.

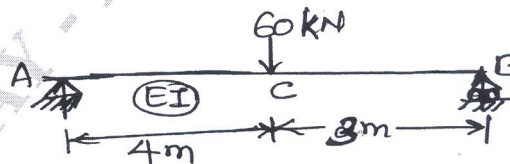


Fig Q3(b)

(08 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.

OR

- 4 a. Determine the deflection under point load of given beam shown in Fig Q4(a) by strain energy method. Take $EI = \text{constant}$.

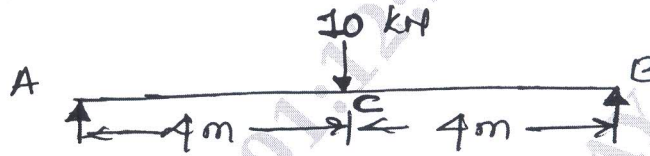


Fig Q4(a)

(08 Marks)

- b. Explain briefly, what is complementary strain energy? (02 Marks)
 c. State and prove the Castigliano's theorems I and II. (06 Marks)

Module-3

- 5 a. A Three hinged parabolic arch at the supports and at the crown has a span of 24m and central rise of 4m. It carries a concentrated load of 50kN at 18m from the left support and udl of 30kN over the left half span. Determine the bending moment, normal thrust and radial shear at a section 6m from the left support. (10 Marks)
 b. A three hinged symmetrical arch of span of length ' l ' and rise ' h ' subjected to udl ' $w/\text{unitlength}$ ' throughout of span. Prove that 'bendingmoment' is zero at all the points. (06 Marks)

OR

- 6 a. A suspension cable having supports at same level has a span of 40m and minimum dip of 40m the cable is loaded with UDL of 10kN/m throughout its length. Calculate minimum and maximum tension in the cable. Also find the length of cable. (08 Marks)
 b. A three hinged parabolic arch is having a span of 36m. It is subjected to uniformly distributed load of intensity 30kN/m from left support hinge to crown hinge. Determine the Normal thrust, radial shear and bending moment at quarter span point located from left support. (08 Marks)

Module-4

- 7 a. By consistent deformation method, analyse the cantilever beam shown in Fig Q7(a). Draw SFD and BMD.

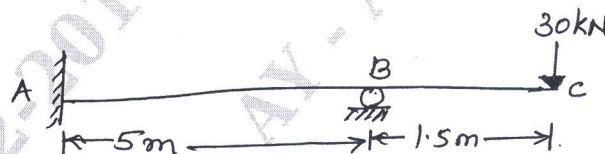


Fig Q7(a)

(10 Marks)

- b. Determine the reaction components of propped cantilever subjected to uniformly distributed load by consistent deformation method. (06 Marks)

OR

- 8 Determine the support moments in the continuous beam shown in Fig Q8 by using three moment equation. Draw BMD.

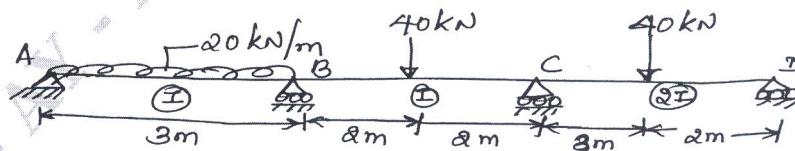


Fig Q8

(16 Marks)

Module-5

- 9 Analyse the frame showing in Fig Q9(a) using “slope deflection method” and draw BMD and SFD.

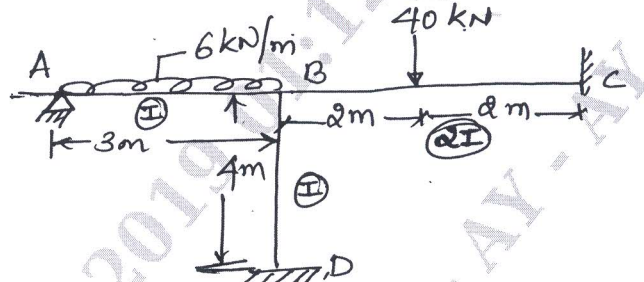


Fig Q9

(16 Marks)

OR

- 10 Analyze and draw BMD for the continuous beam in Fig Q10 by moment distribution method. If support ‘B’ sinks by 30mm and support ‘C’ sinks by 20mm. Take $EI = 24000 \text{ kNm}^2$.

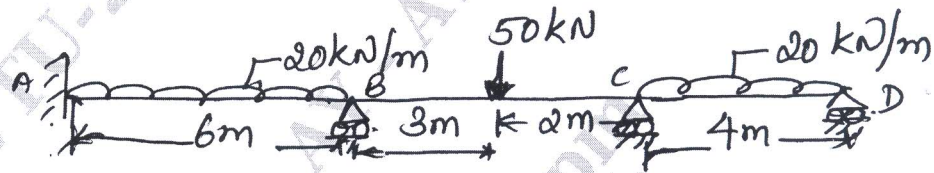


Fig Q10

(16 Marks)
