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## Fourth Semester B.E. Degree Examination, June/July 2019 Analysis of Determinate Structures

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

### Module-1

- 1 a. With an example define statically determinate and statically indeterminate structure. (04 marks)
- b. Determine the force in each member of the roof truss shown in Fig.Q1(b) by method of joints. (12 Marks)

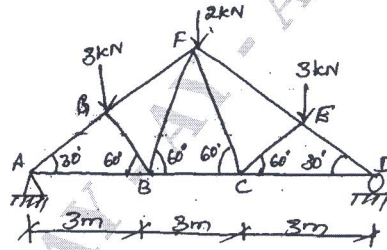


Fig.Q1(b)

OR

- 2 a. Define : i) Conditions of equilibrium ii) Degree of freedom iii) Assumptions in truss analysis. (06 Marks)
- b. Determine the force in members CB and GC and state whether the members are in tension or compression Fig.Q2(b). Adopt method of section. (10 Marks)

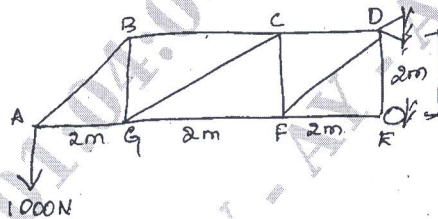


Fig.Q2(b)

### Module-2

- 3 a. Determine the slope @ point 'C' of the beam in Fig.3(a) by moment area method.  $E = 200\text{GPa}$ ,  $I = 6(10^6)\text{mm}^4$ . (08 Marks)

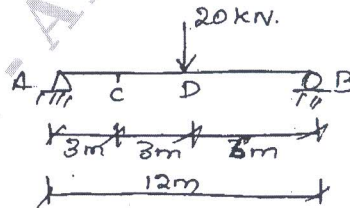


Fig.Q3(a)

- b. By double integration method, determine slope and deflection at A for the beam shown in Fig.Q3(b). (08 Marks)

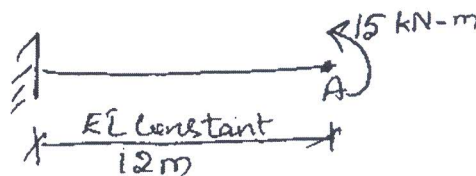


Fig.Q3(b)

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. Using conjugate beam method, determine the slope and deflection @ point B of the beam shown in Fig. 4(a). EI is constant. (08 Marks)

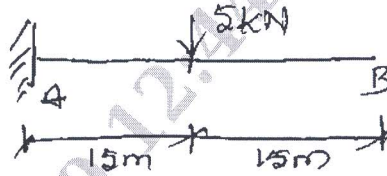


Fig.Q4(a)

- b. Using Machaulay's method of deflection, calculate the deflection under two loads and maximum deflection for the beam shown in Fig.Q4(b). (08 Marks)

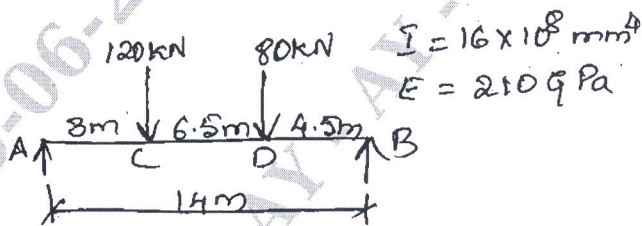


Fig.Q4(b)

**Module-3**

- 5 a. Explain the principles of virtual displacement and forces. (06 marks)  
 b. Using Castigliano's theorems, determine the vertical displacement of joint C of the truss shown in Fig.Q5(b).  $A = 400 \text{ mm}^2$ ,  $E = 200 \text{ GPa}$ . (10 Marks)

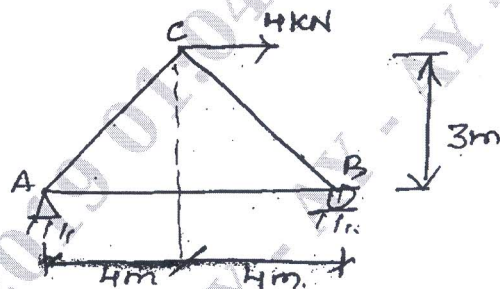


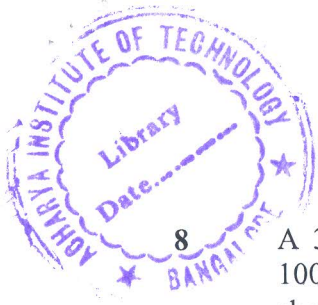
Fig.Q5(b)

OR

- 6 a. Derive strain energy in an axially loaded member. (06 marks)  
 b. A beam AB is simply supported over a span 5m in length. A concentrated load of 30kN is acting at a section 1.25m from left support A. Calculate the deflection under the load point using dummy unit load method.  $E = 200 \times 10^6 \text{ kN/m}^2$ ,  $I = 13 \times 10^{-6} \text{ m}^4$ . (10 Marks)

**Module-4**

- 7 a. A footbridge of width 3m and span 50m is carried by 2 cables of uniform section having a central dip of 5m. If the platform load is  $5 \text{ kN/m}^2$ . Calculate the maximum pull in the cables. Find the necessary section area required if the allowable stress is  $120 \text{ N/mm}^2$ . (10 Marks)  
 b. Derive the expression for the length of cable for supports at same levels. (06 Marks)



OR

- 8 A 3-hinged parabolic arch has span 16m and central rise 4m. It carries a point load of 100kN @ 4m from left support. Evaluate reaction components, moment, thrust and radial shear at a section 6m from left support. Take the equation of arch  $y = 4h x(\ell - x)$  with left hand support as origin. Draw BMD. (16 Marks)

**Module-5**

- 9 a. a udl of 15kN/m covering a length of 3m crosses a girder of span 10m – find the max, shear force and bending moment at a section 4m from left support. (08 Marks)  
 b. Define influence line and its significance. (08 Marks)

OR

- 10 Determine maximum moment and shear force at point C shown in Fig.Q10. The loading is due to axle loads of IRC class A driving vehicle on top of the beam. Assume that the vehicle can move in either direction. (16 Marks)

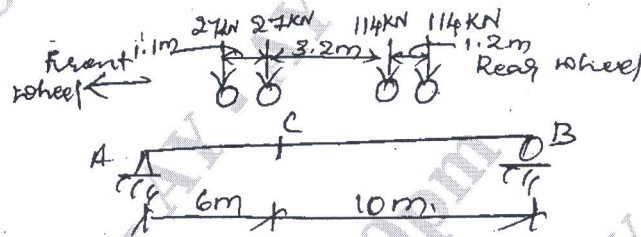


Fig.Q10

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