19/05/14 (0) AN

G 555

(Pages : 6)

Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2014

Fourth Semester

Branch : Civil Engineering

STRUCTURAL ANALYSIS—I (C)

(Old Scheme—Supplementary/Mercy Chance)

[Prior to 2010 Admissions]

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Time : Three Hours

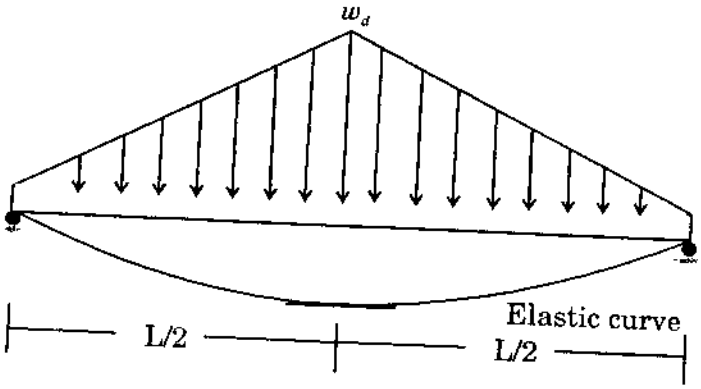
Maximum : 100 Marks

Answer **all** *questions.*

Each question carries 20 *marks.*

1. (a) Find the slope and deflection under at the free end of a cantilever beam with a point load W at the center of span using moment area method. (4 marks)

(b) Determine the maximum deflection of the beam loaded as shown in figure. EI is constant.



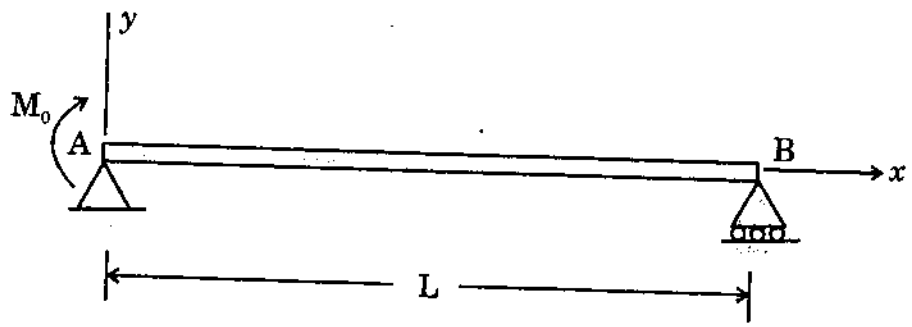
(16 marks)

Or

2. (a) State the moment area theorems with neat sketches. (4 marks)

Turn over

(b) Derive the equation of the deflection curve for a simple beam AB loaded by a couple M_0 at the left-hand support. Also, determine the maximum deflection δ_{max}. (Use the second-order differential equation of the deflection curve.)

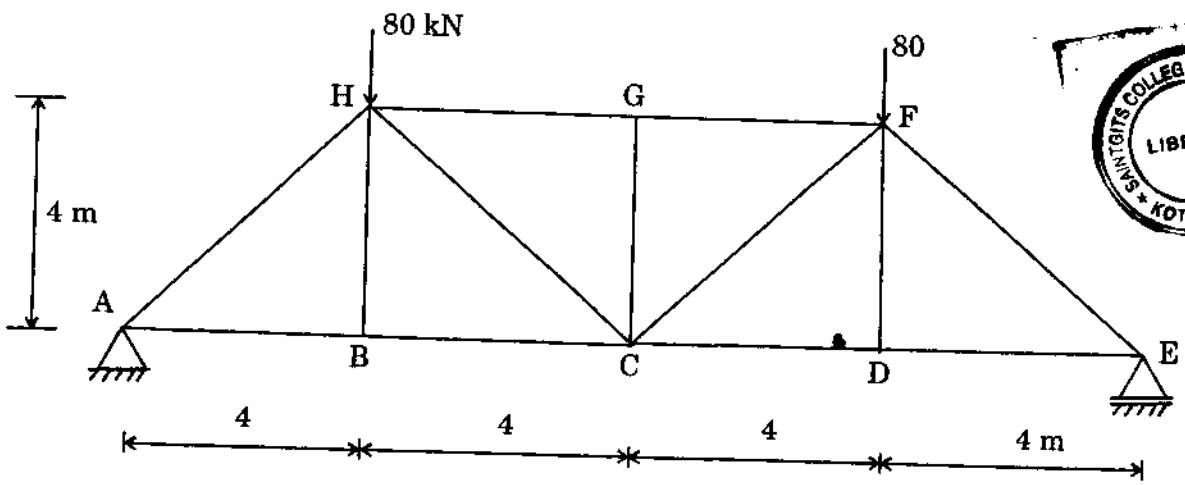


(16 marks)

3. (a) Derive the expression for strain energy stored in shaft element due to torque T at the free end.

(4 marks)

(b) **Determine the vertical displacement of joint C of the truss shown in Figure shown. The** cross-sectional area of each member is $A = 400\ mm^2$ and $E = 200\ GPa$.



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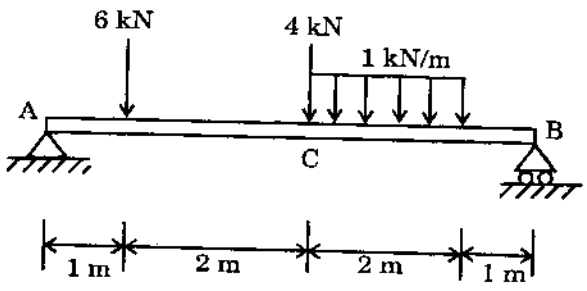
(16 marks)

Or

4. (a) State and prove Maxwell's law of reciprocal deflection. (4 marks)

(b) Determine the deflection at point C of the beam loaded as shown, using strain energy method. EI is constant.



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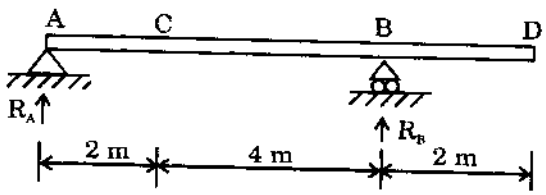
(16 marks)

5. (a) Briefly explain the concept of influence line diagram. (4 marks)

(b) Draw influence lines for the shear force and bending moment at the section C of the beam shown in Fig.



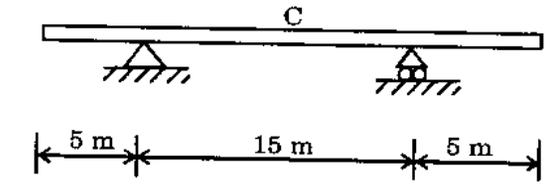
(16 marks)

Or

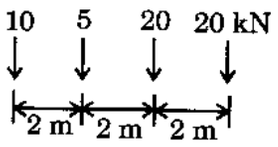
6. (a) Derive the condition for maximum bending moment at a section in a beam due to the movement of a uniformly distributed load over a length shorter than the span of the beam.

(4 marks)

(b) The beam shown in figure (a) is crossed by the train of four loads shown in figure (b). For a section at mid-span, determine the maximum sagging and hogging bending moments.



(a)

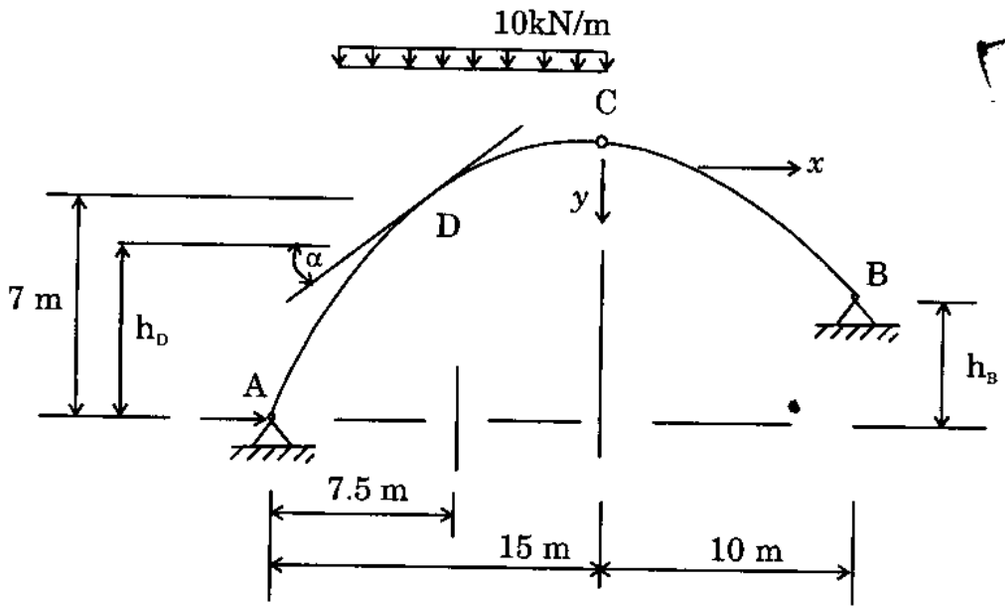


(b)

(16 marks)

7. (a) State and prove Eddy's theorem. (4 marks)

(b) The parabolic arch shown in Figure carries a uniform horizontally distributed load of intensity 10kN/m over the portion AC of its span. Calculate the values of the normal force, shear force and bending moment at the point D.



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(16 marks)

Or

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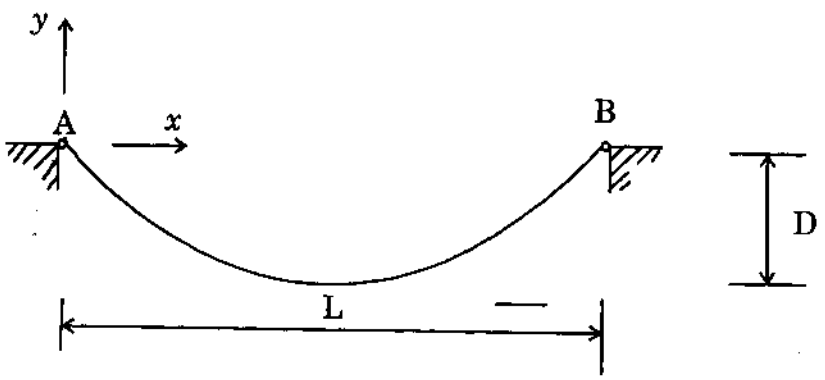
8. A 100kN load crosses a three hinged symmetric parabolic arch of span 30m and rise 6m from left to right. Determine the maximum horizontal thrust, maximum positive and negative bending moment at a section 12m from the left hinge support. (20 marks)

9. (a) Determine the equation of the deflected shape of the symmetrically supported cable shown, if its self- weight is w_s per unit of its actual length.



(4 marks)

(b) A cable of a suspension bridge has a span of 80 m, a sag of 8 m and carries a uniform horizontally distributed load of 24kN/m over the complete span. The cable passes over frictionless pulleys at the top of each tower which are of the same height. If the anchor cables are to be arranged such that there is no bending moment in the towers, calculate the inclination of the anchor cables to the horizontal. Calculate also the maximum tension in the cable and the vertical force on a tower.

(16 marks)

Or

10. (a) Explain the effects of temperature change on suspension cables. (4 marks)

(b) A suspension cable has a sag of 40 m and is fixed to two towers of the same height and 400 m apart; the effective cross-sectional area of the cable is 0.08 m^. However, due to corrosion, the effective cross- sectional area of the central half of the cable is reduced by 20%. If the stress in the cable is limited to 500N/mm^, calculate the maximum allowable distributed load the cable can support. Calculate also the inclination of the cable to the horizontal at the top of the towers.

(16 marks)

[5 × 20 = 100 marks]

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