C 15210

(Pages 4)

Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, DECEMBER 2010

CE 04 403—STRUCTURAL MECHANICS—I

(2004 Admissions)

Time : Three Hours

Maximum : 100 Marks

Assume any missing data suitably.
Question I *is* **compulsory.**
Answer one each from Questions II, III, IV and V.

I. (a) Calculate the deflection at point A of the elastic beam having bending stiffness as shown in Figure below. Use energy method.

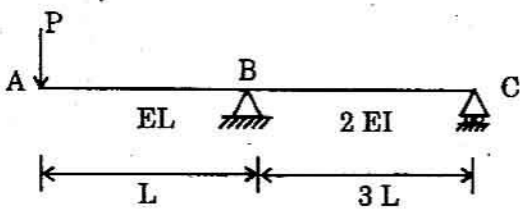

Fig.1.

(b) A cantilever beam is subjected to a u.d.l. q_0 per unit length. Find the deflection and slope at the tip of the centilever by energy method.

(c) Analyse the following continuous beam by consistent deformation. Find the support reactions.

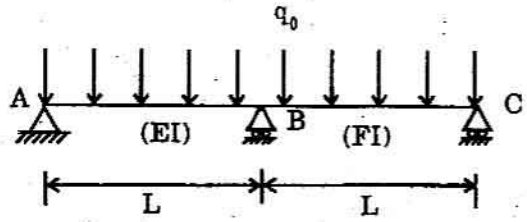

Fig.2.

(d) Find the strain energy of the following truss. Axial rigidity = E_A.

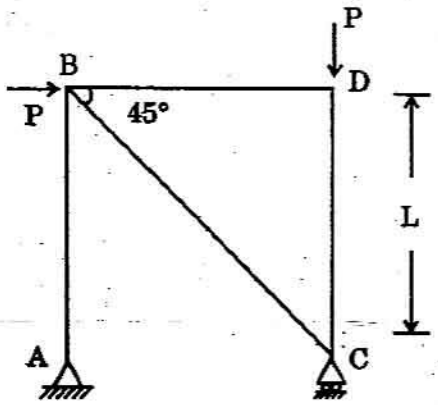

Fig.3.

Turn over

(e) An S.S. beam of span 9 m is subjected to a moving u.d.l. of length 3 m and intensity 5 kN/m. Find the absolute maximum B.M. and absolute maximum shear in the beam.

(f) A propped cantilever is of span 8 m. It is clamped at left and S.S at the right. Draw the I.L.D. for the B.M. at the left if a unit load moves from left to right.

(g) A cable of span L and dip is subjected to a u.d.l. q_0. Show that if h is small :

$T_{max} - T_{min} = Wh$.

(h) Find the expression for thrust of a three-hinged and subjected to u.d.l. q_0. Length L, rise of the arch = h.

(8 × 5 = 40 marks)

II. (a) The vertical bent cantilever shown in the figure carries a vertical load P at free end C as shown. The flexural rigidity EI is constant throughout. Estimate the vertical and horizontal displacement at C.

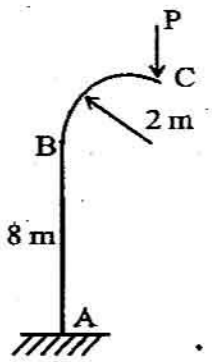

Fig. 4.

Or

(b) Determine the changes in lengths of members EF and FG of the truss shown in the figure. The structure is loaded as shown in the Figure. All areas are 1000 mm^2. E = 2 × 10^5 N/mm^2.

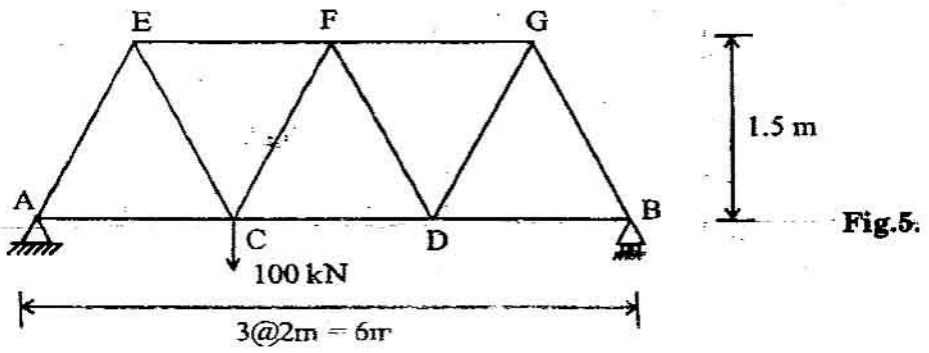

Fig.5.

III. (a) Determine the support moments for the beam shown below. E is constant and I values are indicated on the beam.

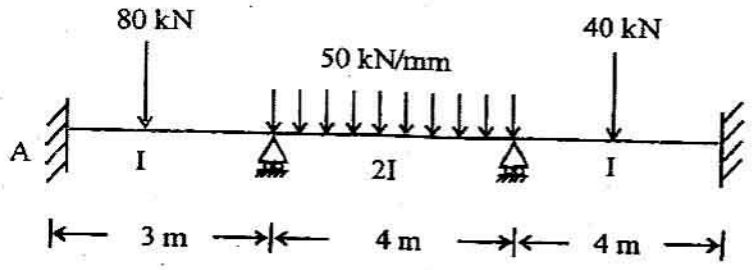

Fig.6.

(15 marks)

Or

(b) Calculate the forces in the members of the truss shown in figure below, if the roller support at E sinks by 1 mm. Assume A = 5000 mm^2 for all members and E = 2×10^5 N/mm^2. Choose AD = X_1 and reaction at E = X_2 as redundants.

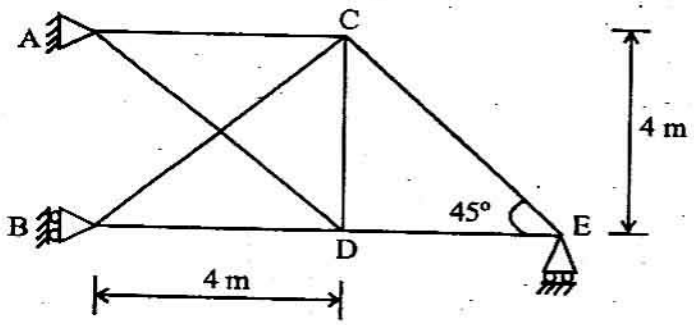

Fig.7

(15 marks)

IV. (a) A live load 20 kN/m moves on the girder shown in Figure. Find

(i) Maximum vertical reaction at support A.

(ii) Maximum vertical reaction at support B.

(iii) Maximum vertical reaction at support C.

(iv) Maximum B.M. at D.

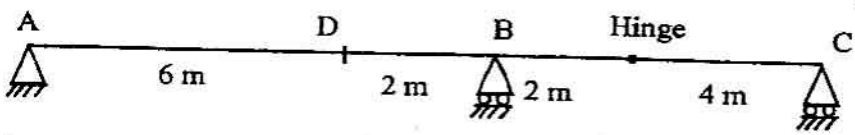

Fig. 8.

(15 marks)

Or

(b) For a fixed-fixed beam of span 6 m, draw the I.L.D. for the moments and reactions at the supports when a unit load moves from left to right. Get the ordinates at 1m interval.

(15 marks)

(a) The two-hinged girders of a suspension bridge have a span of 120 m, the dip of the supporting cable being 12 m. If the girder is subjected to two point loads 180 kN and 300 kN at distances 24 m and 96 m from the left end, find the shear force and bending moment for the girder at 30 m from the left end. Find also the maximum tension in the cable.

(15 marks)

Or

(b) A three-hinged parabolic arch ACB of span 50 m and rise 20 m carries a u.d.l of 50 kN/m on AC and two concentrated loads 100 kN each at distances 5 m and 10 m from B. Find the horizontal thrust, the bending moment, normal thrust and radial shear at a section D 15 m from A.

(15 marks)

[4 × 15 = 60 marks]