Vidyalankar

S.Y. Diploma : Sem. IV [CE/CS/CR/CV]

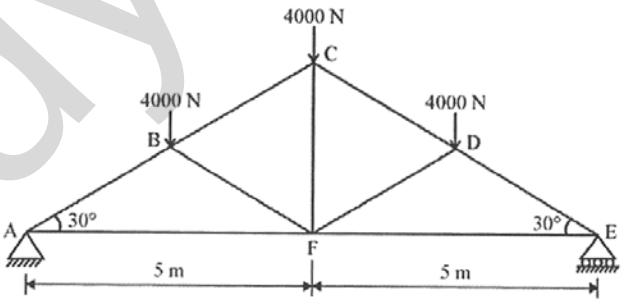
Theory of Structures

Time: 3 Hrs.] Prelim Question Paper **[Marks : 100**

Instructions :
(1) All Questions are Compulsory.
(2) Answer each next main Question on a new page.
(3) Illustrate your answers with neat sketches wherever necessary.
(4) Figures to the right indicate full marks.
(5) Assume suitable data, if necessary.
(6) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

1. (a) Attempt any **SIX** of the following : **[12]**
(i) Define direct stress with expression.
(ii) Write the value of maximum slope and maximum deflection in case of simply supported beam with u.d.l. load over entire span in terms of EI.
(iii) State the relation between slope, deflection and radius of curvature.
(iv) A cantilever of span 'L' carries a point load W at L from fixed end. State deflection at free end in terms of EI.
(v) Write the principle of super position.
(vi) Define carry over moment.
(vii) Define stiffness factor.
(viii) State the condition of redundant and non redundant frames.

(b) Attempt any **TWO** of the following : **[8]**
(i) Describe middle third rule with neat diagram.
(ii) Draw stress distribution diagram for
(i) $\sigma_a > \sigma_b$ (ii) $\sigma_a = \sigma_b$ (iii) $\sigma_a < \sigma_b$
(iii) Calculate the forces in the members AB, BD and DC for the truss shown the in fig. using method of section.



2. Attempt any **FOUR** of the following : **[16]**
(a) Calculate limit of eccentricity for rectangular section having dimensions 1200 mm $\times$ 800 mm from basic principle.
(b) A hollow circular column having external diameter 200 mm and internal diameter 160 mm carries an eccentric load of 60 KN at an eccentricity of 40 mm from vertical axis. Calculate σ_{max} and σ_{min}. Draw stress distribution diagram.

(c) A masonry wall 10m high, 3 m wide and 1.5 m thick is subjected to a wind pressure of 1.2 KN/m^2. Find maximum and minimum intensity induced on the base, if the unit weight of masonry is 22 KN/m^3.

(d) A wooden cantilever beam of span 2.5 m has a cross section 130 mm wide and 240 mm deep. A load of 6 KN is acting at free end, calculate the deflection and slope at the free end. Take E = 1×10^5 N/mm^2.

(e) Giving sketch state Clapeyron's theorem of three moments for beam having same MI and different MI giving meaning of terms used in it.

(f) A simply supported beam of span 4 m carries a central point load of 20 KN and u.d.l. of 10 KN/m over entire span. Find maximum slope and maximum deflection of the beam.
Ixx = 2×10^8 mm^4 E = 2×10^5 N/mm^2

3. Attempt any **FOUR** of the following : **[16]**

(a) State the boundary conditions for free end and hinged end w.r.t. slope and deflection.

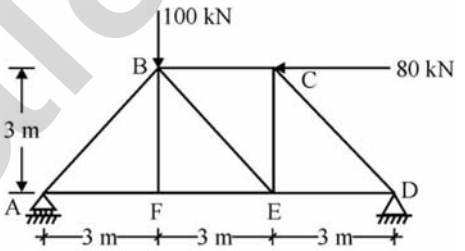
(b) A cantilever of 130 mm $\times$ 180 mm deep projects 2 m out of wall carries point load of 30 kN at 1 m from free end. Find slope and deflection below point load. Take E = 105 kN/mm^2.

(c) State how net BM is find out for a fixed beam using superposition theorem. Explain it with sketch.

(d) Using first principle find fixed end moment for a fixed beam carrying point load at mid span.

(e) Explain with sketch, perfect and imperfect frames.

(f) Using method of section find the forces in the member BC, BE & FE of the frame as shown in figure.



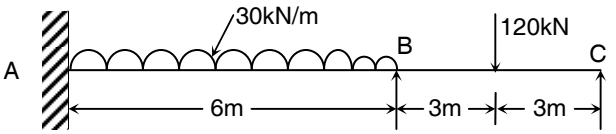
4. Attempt any **FOUR** of the following : **[16]**

(a) A continuous beam ABC is supported on three supports at same level AB = BC = 4 m. Both spans carry central point load of 100 kN each. Calculate moment at B using theorem of three moments and draw BMD giving only net B.M.

(b) State Clapeyron's theorem of three moments for same EI and different EI and state meaning of each term involved using neat sketch.

(c) A continuous beam ABC is simply supported at A, B and C such that AB = BC = 3 m. Span AB carries a u.d.l. of 50 kN/m from A to B. Span BC carries a point load of 30 kN at 1m from C. Calculate support moment at B using theorem of three moments.

(d) Find the moments at A, B and C for the continuous beam as shown in Figure below by moment distribution method.



(e) Determine distribution factors at continuity for continuous beam A–B–C–D which is fixed at A and supported over B, C and D. Take AB = BC = 4 m and CD = 5 m. Assume same MI for all spans.

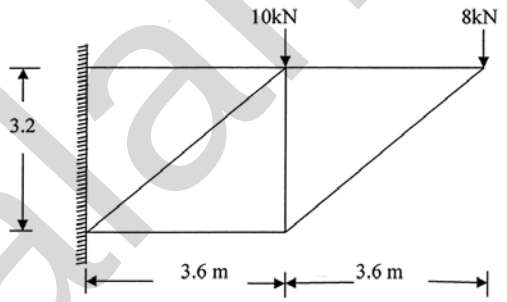
(f) A continuous beam ABC of uniform M.I. and carries a central point load of 80 kN on span AB. A u.d.l. of 30 kN/m is acting over the entire span BC. AB = 6 m, BC = 4 m. A and C are simply support. Calculate the support moment using three moments theorem only and draw only SFD. Solve using moment distribution method if $I_{AB} = 2I$ and $I_{BC} = I$.

5. Attempt any **TWO** of the following : **[16]**

(a) A masonry chimney of uniform hollow rectangular section has size 2 m $\times$ 1.4 m and has thickness 0.3 m. It is subjected to horizontal sind pressure of 1.5 kPa. Find maximum height of chimney if maximum compressive stress at the base is limited to 280 kN/m^2. Also state nature of minimum stress. Take density of masonry as 22 kN/m^3.

(b) A continuous beam ABCD is supported at A and D and is continuous over B and C such that AB = 4 m, BC = 6 m, CD = 6 m. Central point loads of 90 kN and 100 kN act on AB and BC. CD carries a u.d. load of 10 kN/m. Determine support moments using three moments theorem. Draw BM diagram.

(c) Determine nature and magnitude of forces in all the members of the frame as shown in figure. Also find support reactions.



6. Attempt any **TWO** of the following : **[16]**

(a) A simply supported beam of 6 m span carries an Udl of 20 kN/m over entire beam and a point load of 60 kN at 2 m from right hand support using Macaulay's method, locate the point of maximum deflection and find its value in terms of EI.

(b) A fixed beam of span 8 m carries 5 kN/m udl over entire length along with a point load of 40 kN at 2 m from left hand support. Find net BM at point load and draw BMD and SFD.

(c) A continuous beam ABC is simply supported at A, B & C. AB = 5 m and carries udl of 40 kN/m, BC = 4 m and carries point load at 2 m from C of 50 kN. Draw BMD and SFD. Using Clapeyron's theorem of moments.

❑ ❑ ❑ ❑ ❑