

17422

11920

4 Hours / 100 Marks

Seat No.

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- 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) Use of Non-programmable Electronic Pocket Calculator is permissible.
 - (7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. (A) Attempt any SIX of the following :

6 × 2 = 12

- (a) Define limit of eccentricity.
- (b) State the formula for calculation of radius of curvature of deflected beam.

- (c) Define deflection of a beam.
- (d) A cantilever of span 'L' carries a point load 'w' at 'L' from fixed end.
State deflection at free end in terms of EI.
- (e) Define fixed beam.
- (f) Define carry over factor of moment distribution method.
- (g) Define stiffness factor.
- (h) Explain perfect truss with example.

(B) Attempt any TWO of the following :

4 × 2 = 8

- (a) Differentiate between Direct load and eccentric load.
- (b) Define core of section. Sketch it for rectangular section.
- (c) Explain steps involved in method of joint for calculation of forces in the member of a frame.

2. Attempt any FOUR of the following :

4 × 4 = 16

- (a) A rectangular column is 250 mm wide and 100 mm thick. It carries a load of 200 kN at an eccentricity of 100 mm in the plane bisecting thickness. Find the maximum and minimum intensities of stress in section.

- (b) A hollow C.I. column of external diameter 300 mm and internal diameter 250 mm carries an axial load 'w' kN and a load of 100 kN at an eccentricity 125 mm. Calculate the maximum value of 'w' so as to avoid the tensile stresses.
- (c) A chimney having diameter 4 m and 50 m height. It is subjected to a horizontal wind pressure of 1.5 kPa normal to chimney. Find maximum bending stress in chimney.
- (d) A simply supported beam carries a u.d.l. of 4 kN/m over entire span 4 m. Find deflection at mid span in terms of EI.
- (e) A cantilever of span 2 m carries 10 kN load at free end. Find deflection at free end if $EI = 15 \times 10^3 \text{ kN.m}^2$.
- (f) Write Clapeyron's moment theorem for a beam with different M.I giving meaning of each term.

3. Attempt any FOUR of the following :

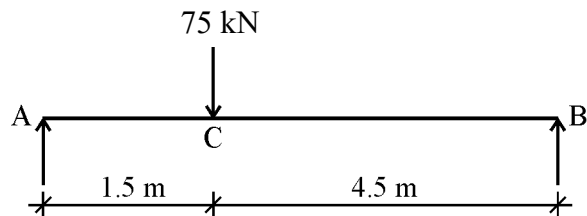
4 × 4 = 16

- (a) State any two advantages and two disadvantages of a fixed beam over simply supported beam.
- (b) A fixed beam of span 6 m carries a point load of 100 kN at 4 m from left support. Calculate fixed end moments.

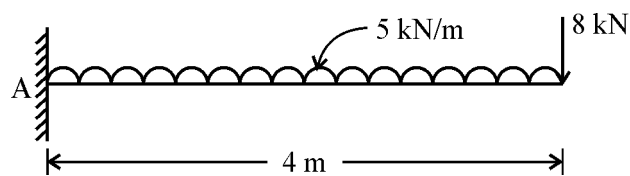
P.T.O.

- (c) Calculate maximum deflection at a beam as shown in figure. Use Macaulay's method.

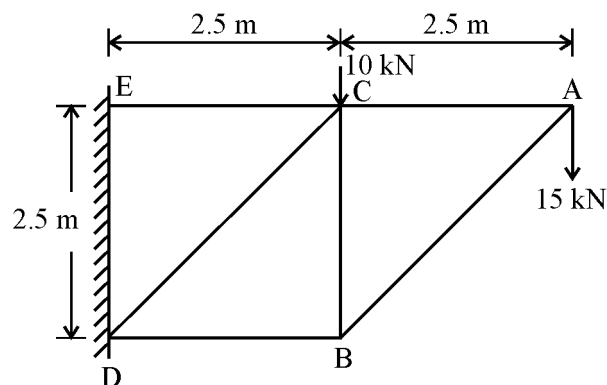
Take $E = 2 \times 10^8 \text{ kN/m}^2$, $I = 0.7330 \times 10^{-4} \text{ m}^4$



- (d) Find the slope at free end of beam as shown in figure.



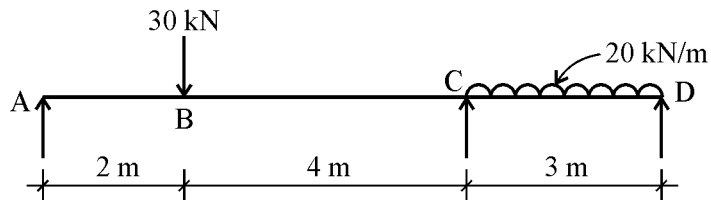
- (e) State any four assumptions made in analysis of simple frame.
- (f) Determine the forces in the members AB and BC only. Use method of section.



4. Attempt any FOUR of the following :

4 × 4 = 16

- (a) Write stepwise procedure for analysis of a continuous beam.
- (b) Find the support moment of a continuous beam as shown in figure. Use Clapeyron's theorem.



- (c) Draw typical deflection curve for a continuous beam of three spans. (one end fixed and other overhang)
- (d) Differentiate between symmetrical and unsymmetrical portal frame.
- (e) A continuous beam ABCD is supported at A, B, C and D. AB = 5 m, BC = 8 m and CD = 4 m. Calculate the distribution factors at joint 'B' and 'C'. Support A is fixed end.
- (f) Using moment distribution method, determine the moment at fixed end of a propped cantilever of span 5 m carrying uniformly distributed load 30 kN/m over the entire span.

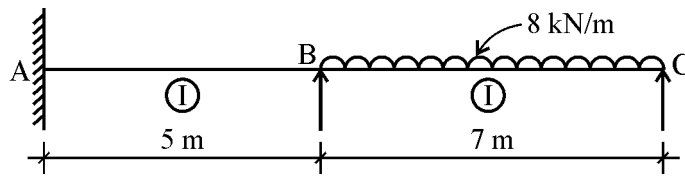
5. Attempt any TWO of the following :

8 × 2 = 16

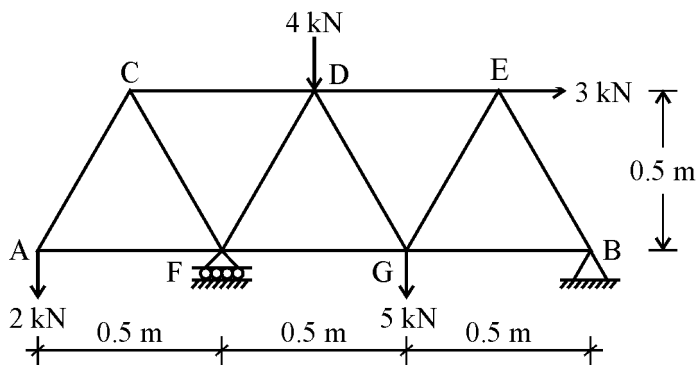
- (a) A masonry wall 6 m high of solid rectangular section 3 m wide 1 m thick. A horizontal wind pressure 950 N/m² acts on a 3 m side. Find the maximum and minimum stresses induced at base, if the density of masonry is 19.5 kN/m³. Draw stress diagram.

P.T.O.

- (b) Draw B.M.D. for a continuous beam as shown in fig. Use moment distribution method.



- (c) A truss is loaded as shown in fig. Determine the nature and magnitude of forces in the members CD, FD and FG.

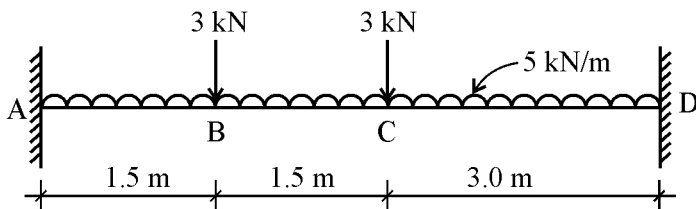


6. Attempt any TWO of the following :

8 × 2 = 16

- (a) A beam ABC, AB = 4 m, BC = 2 m. Simply supported at A and B carrying point load at free end 'C' 10 kN. Compute maximum deflection in a beam, if $I = 8 \times 10^7 \text{ mm}^4$; $E = 2 \times 10^5 \text{ N/mm}^2$.

- (b) Draw SFD and BMD for beam show in in Fig.



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- (c) Draw SFD and BMD for a beam show in fig. by Clapeyron's theorem of three moments.

