

22402

21222

4 Hours / 70 Marks

Seat No.

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15 minutes extra for each hour

- 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. Attempt any FIVE of the following: **10****
- a) Define core of the section.
- b) Give relationship between bending moment, slope and deflection.
- c) State the effect of continuity in continuous beam.
- d) Define
- i) Carry over factor
- ii) Stiffness factor
- e) With sketch, state the different types of portal frame.
- f) State the middle third rule.
- g) Identify nature of support if
- i) $\theta = 0, y = 0$
- ii) $\theta = 0, y \neq 0$

P.T.O.

2. Attempt any THREE of the following:

12

- Derive the expression for limit of eccentricity for rectangular section ($b \times d$) dimensions.
- Calculate intensity of stresses at base of hollow rectangular column $500\text{mm} \times 300\text{mm}$ external dimension and 50mm thickness subjected to vertical load of 160kN with 200mm eccentricity parallel to 500mm side of column.
- Calculate the maximum and minimum stresses at the base of masonry chimney having outer dimension $4\text{m} \times 4\text{m}$ and 1m thickness. Height of the chimney is 20m subjected to wind pressure of 1.2kN/m^2 . Use wt. of masonry as 22kN/m^3 .
- A short column of external diameter 250mm and internal diameter 200mm carries an eccentric load. Find the eccentricity which the load can have without producing section in the section of column.

3. Attempt any THREE of the following:

12

- Using Macaulay's method calculate slope under point load of 15kN acting at 3m from left hand support of simply supported beam of span 5m in terms of EI .
- Calculate fixed end moments and draw BMD for fixed beam shown in Fig. No. 1.

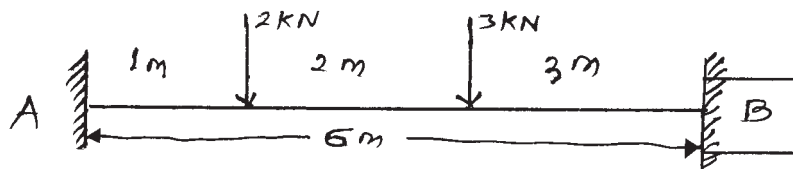


Fig. No. 1.

- c) Calculate the value of F for fixed beam as shown in Fig. No. 2. if $M_A = M_B$.

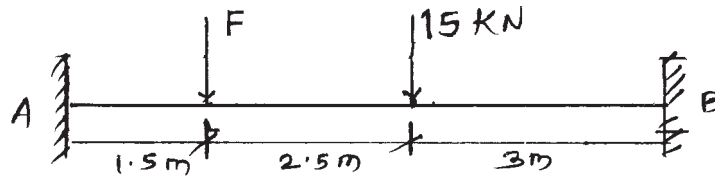


Fig. No. 2.

- d) Explain the concept of fixity with effect in fixed beam.

4. Attempt any THREE of the following:

12

- a) Explain the concept of imaginary zero span in case of Clapeyron's theorem.
- b) Calculate the distribution factors for the members PQ, PR and PS as shown in Fig. No. 3. Take $EI = \text{constant}$.

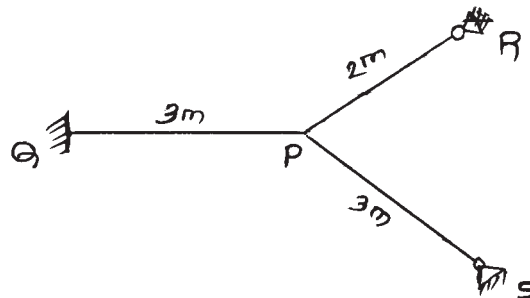


Fig. No. 3.

- c) Draw the sketches of any four perfect trusses.
- d) Draw SFD for continuous beam as shown in Fig. No. 4. Also calculate B.M. at support 'B'.

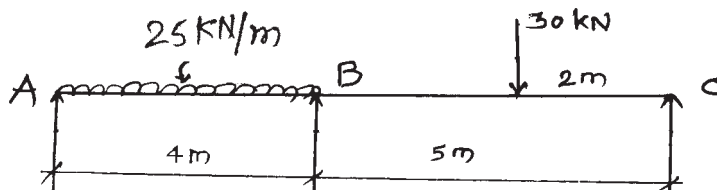


Fig. No. 4.

- e) Calculate support moments and draw BMN of a beam shown in Fig. No. 5. by moment distribution method.

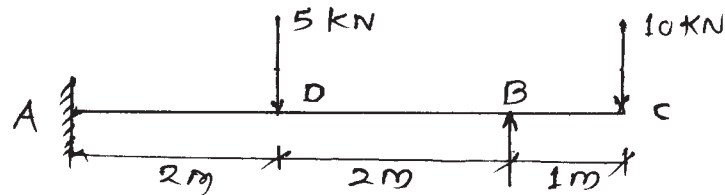


Fig. No. 5.

5. Attempt any TWO of the following:

12

- a) Calculate slope and deflection at free end of cantilever beam as shown in Fig. No. 6. having cross section 160mm width and 220mm depth. Using standard formulae and take $E = 201 \text{ GPa}$.

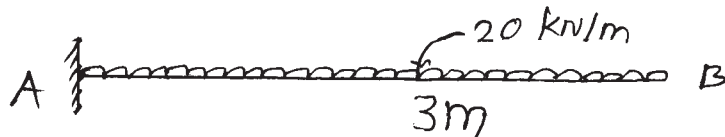


Fig. No. 6.

- b) Using three moment theorem, calculate support moments for beam as shown in Fig. No. 7.

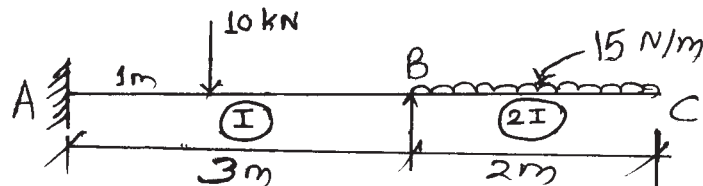


Fig. No. 7.

- c) Calculate slope at 'B' and deflection at 'C' of cantilever beam in terms of EI as shown in Fig. No. 8. by using Macaulay's method.

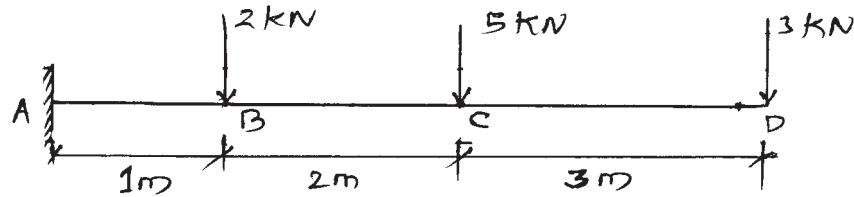


Fig. No. 8.

6. Attempt any TWO of the following:

12

- a) Using moment distribution method, calculate the support moments of beam as shown in Fig. No. 9.

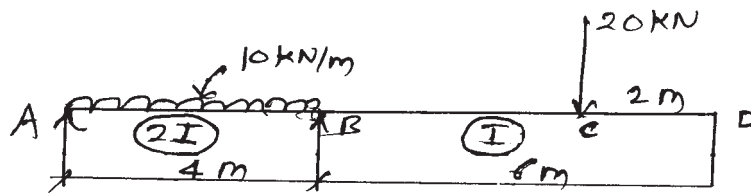


Fig. No. 9.

- b) Using method of joints calculate magnitude and state the nature of forces in the members AB, BD and DC of the truss shown in Fig. No. 10.

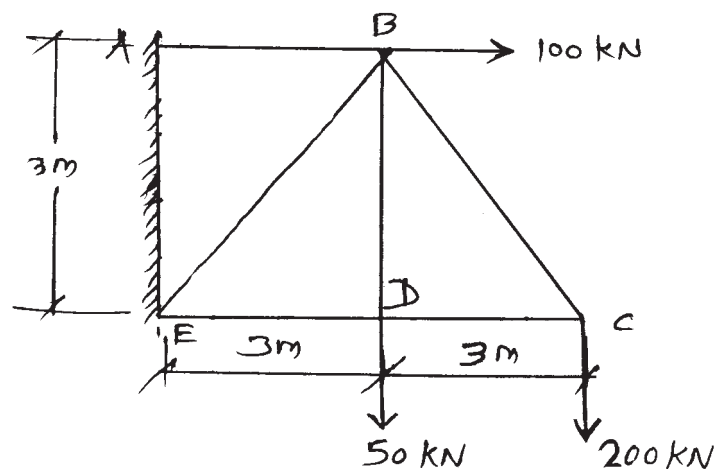


Fig. No. 10.

- c) Calculate magnitude and state the nature of forces in the members BC and FE of truss as shown in Fig. No. 11. by using method of sections.

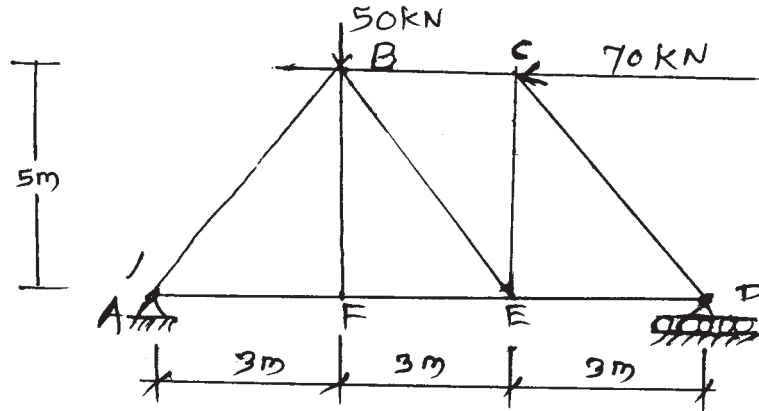


Fig. No. 11.