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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.   **Attempt any FIVE of the following :**   **10**

a) Define slope and Deflection of beam with Neat sketch.

b) Give relationship between bending moment, slope and deflection.

c) Define fixed beam.

d) State any two advantages and disadvantages of fixed beam over S.S. beam.

e) State the effect of continuity on a continuous beam.

f) Define stiffness factor and distribution factor.

g) Define perfect frame with neat sketch.

Marks

2. **Attempt any THREE of the following :** 12

a) Using standard formulae calculate maximum slope and deflection in terms of EI of a simply supported beam as shown in Fig. No. 1. using std. formulae.
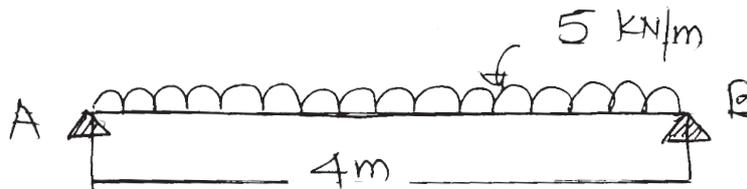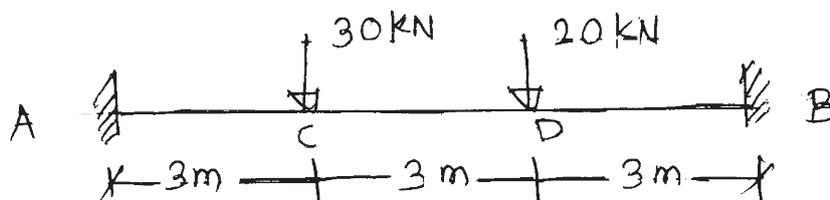

Fig. No. 1

b) A cantilever beam of length 2.5 m carries a UDL of 10 kN/m over an entire span. If the section is rectangle 100 mm wide and 300 mm deep. Find slope at the free end and deflection at the free end, Take E = 100 kN/mm^2.

c) A simply supported beam of span 6 m carries a UDL of 20 kN/m over the entire span and a point load of 45 kN at 2 m from left hand support. Using Macaulays method, Locate the point of maximum deflection and find its value in term of EI.

d) A cantilever beam of 3 m span is subjected to Udl of 3 kN/m over the entire span and a point load of 4 kN at 2 m. from the free end. Calculate the slope and Deflection under the point load. Consider E = 210 GPa and I = 2.85×10^8 mm^4. Use Macaulay's method.

3. **Attempt any THREE of the following :** 12

a) Explain the principle of super position with an example.

b) Calculate fixed end moment and draw BMD for a fixed beam as shown a Figure No. 2.

Fig. No. 2

Marks

c) Fixed Beam 8 m span carries a udl of 1 kN/m over entire span and a point load of 6 KN at 3 m from left support. Calculate fixed end moment and Draw BMD.

d) State and explain Clapeyron's theorem of three moments.

4. **Attempt any <u>THREE</u> of the following :**   **12**

a) Draw BMD for continuous beam ABC as shown in Figure No. 3 calculate B.M. at support B using the theorem of three moments.
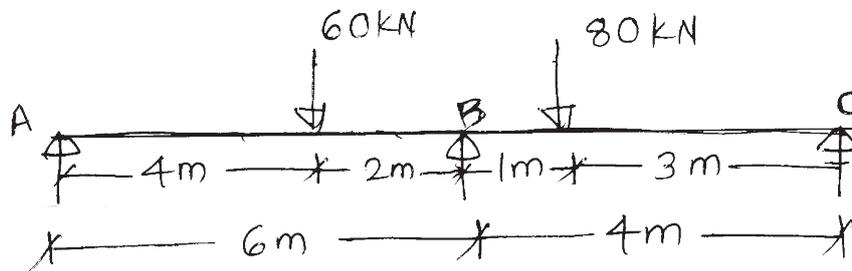

Fig. No. 3

b) Beam ABCD is simply supported at A and D and continuous over B and C. Calculate distribution factors.
Take AB = BC = CD = 6 m and $I_{AB} = I$, $I_{BC} = 2 I$, $I_{CD} = 1.5 I$.

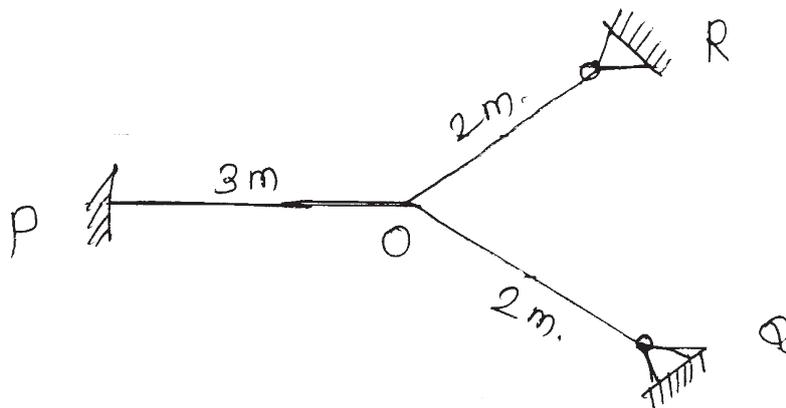c) Calculate distribution factors for the members OP, OQ and OR for the joint O as shown in Figure No. 4.

Fig. No. 4

Marks

d) Differentiate between symmetrical portal frame and unsymmetrical portal frame with neat sketcher. (Any four points)

e) State the method of Analysis of the frame and explain any one in details.

5. Attempt any TWO of the following :   12

a) For the continuous Beam ABC as shown in Figure No. 5. Calculate the support moments by three moments theorem and draw BMD and SFD.
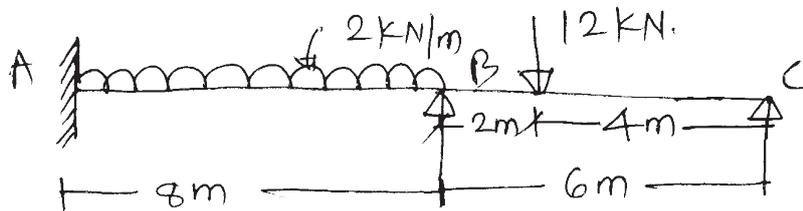

Fig. No. 5

b) A continuous Beam ABC consists of two spans AB and BC of 6 m and 4 m respectively. M.I. of section in AB is twice that of section BC. Span AB carries a central point load of 100 kN and a Udl of 25 kN/m is acting over the entire span BC Considering A and C as simple supports. Draw SFD and BMD giving all its values. Use three moment theorem.

c) Using the moment distribution method, calculate support moments and Draw BMD for the beam as shown in Figure No. 6 EI is constant.

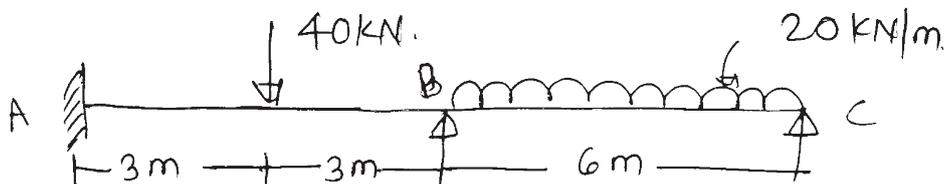

Fig. No. 6

6. Attempt any <u>TWO</u> of the following : **12**

   a) A continuous Beam of uniform is fixed at A and simply supported at B and C. Span AB = 6 m and carries Udl of 40 kN/m and BC = 8 m, carries 80 kN point load at it's mid span. Using moment distribution method calculate the support moment and Draw BMD.

   b) Determine the nature and magnitude of forces in the members (AB, BC, FD and CF) of the frame as shown in Figure No. 7. Also find a support Reaction using the method of joints.
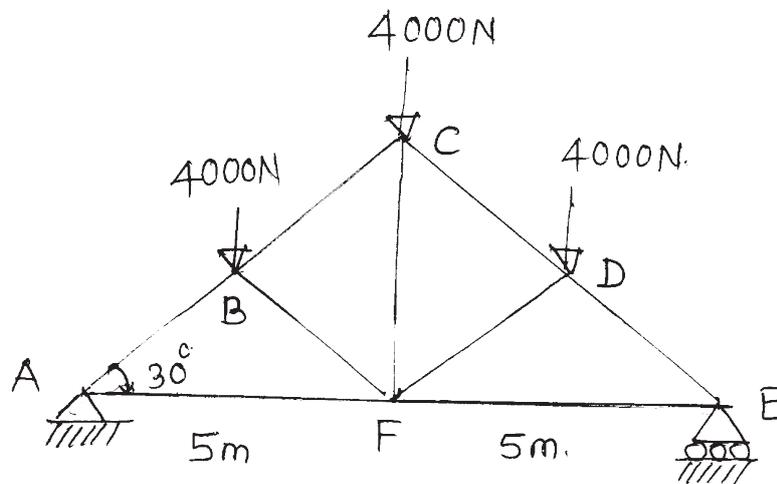

Fig. No. 7

   c) Using the method of sections calculate the magnitude of forces and its nature of members BC, BE and AE. For frame as shown in Figure No. 8.
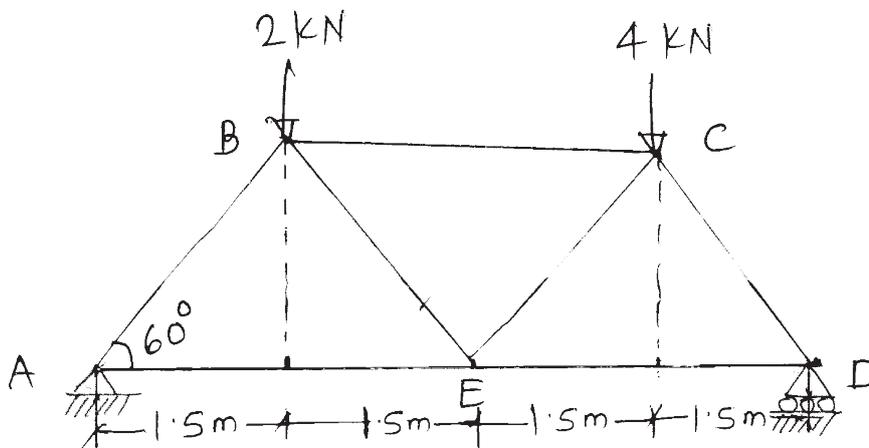

Fig. No. 8