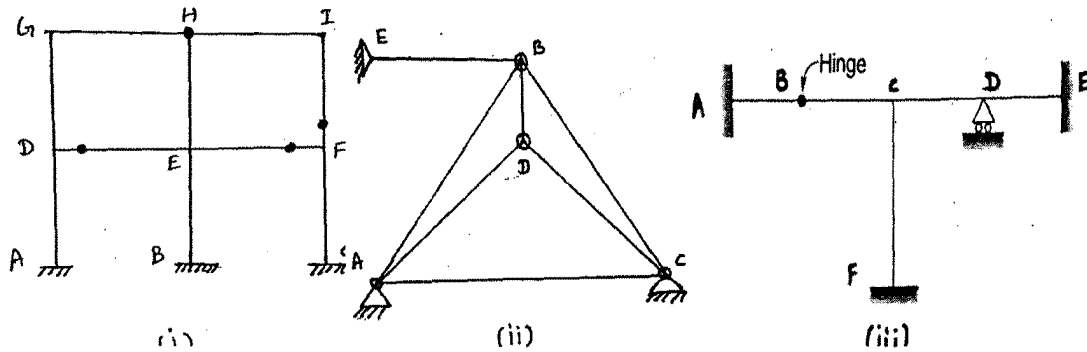


(3 Hours)

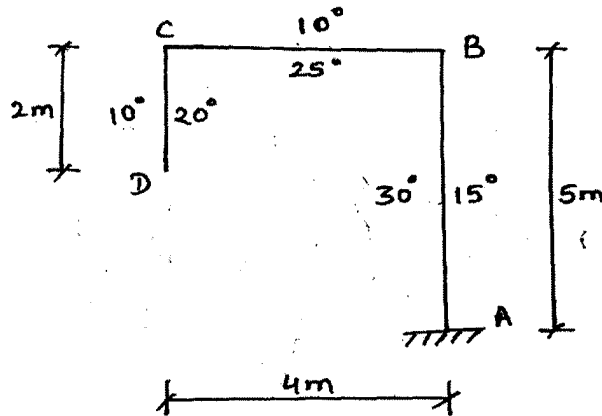
Max Marks: 80

- N.B** (1) Question No.1 is compulsory.
 (2) Attempt **any three** questions of the remaining five questions.
 (3) Assume suitable data if required.
 (4) Figures to the right indicate full marks.

- Q1.** a) For the structures shown below, determine
 i) Static indeterminacy (clearly indicating external and internal). (03)
 ii) Kinematic indeterminacy (consider axial rigidity of flexural members). (03)

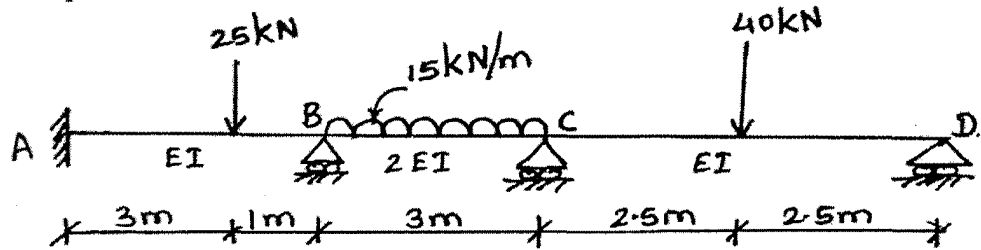


- b) For a rigid jointed frame subjected to temperature variation as shown in figure. Determine the horizontal deflection at 'D'. Assume depth of all members as 250 mm, neglect axial forces. Assume $\alpha = 12 \times 10^{-6} / ^\circ\text{C}$. (07)

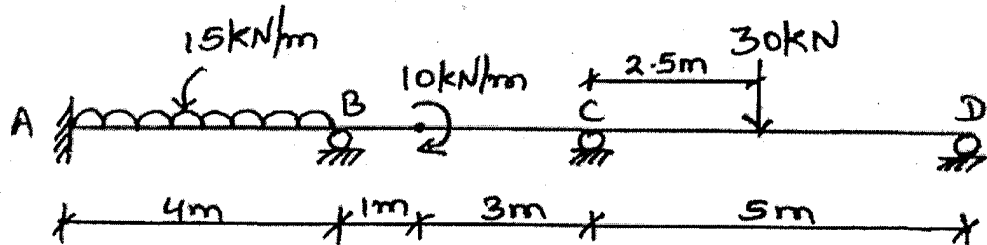


- c) Define flexibility and stiffness, and state the relation between them. (03)
 d) Define and explain distribution factor and carry over factor. (04)

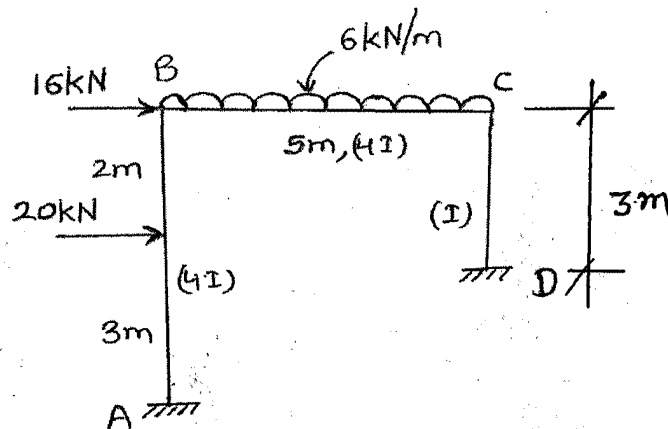
- Q2). a) Analyse the continuous beam shown in figure below by **Moment distribution method** or **Kani's method**. Note that Support 'B' sinks by 12 mm during loading. Draw BMD and deflected shape. Take $EI = 1600 \text{ kNm}^2$. (12)



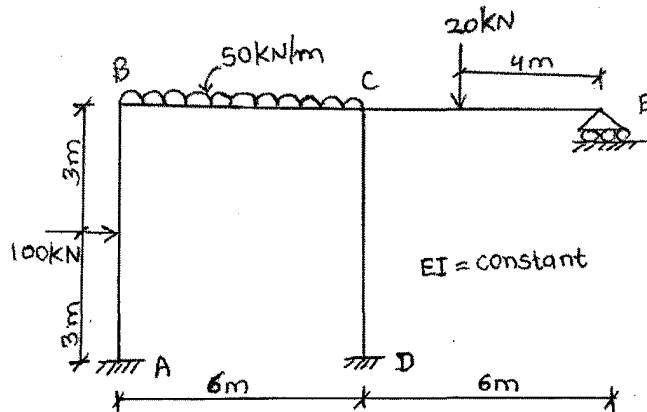
- b) Analyse the continuous beam shown in figure below by **Clapeyron's three moment theorem** or **Slope deflection method** and draw BMD. $EI = \text{constant}$. (08)



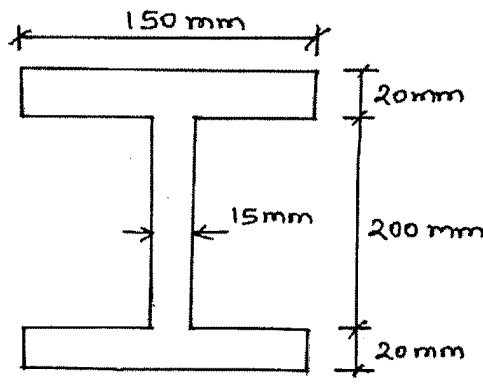
- Q3). Using **Flexibility matrix method** analyse the portal frame shown in figure below. Draw (20) BMD and deflected shape.



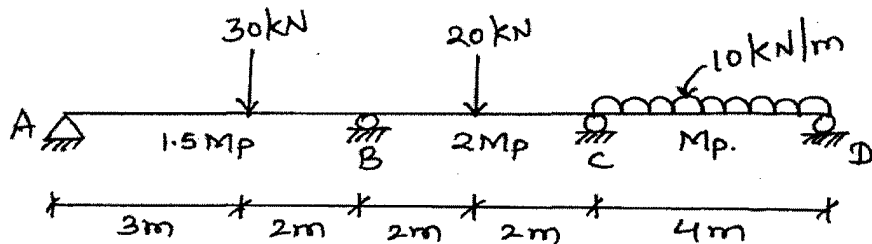
- Q4). Using **Stiffness matrix method**, analyse the given portal frame. Draw BMD and deflected shape. (20)



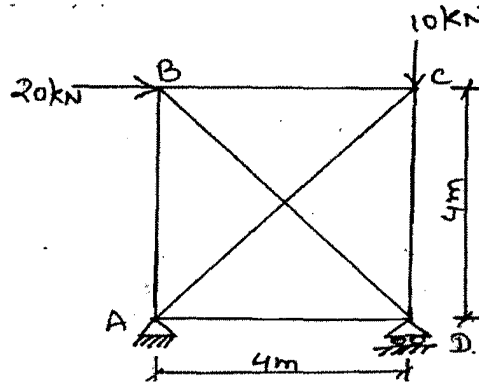
- Q5). a) Find the shape factor for the beam cross section shown in figure below and find ' M_p ', if $F_y = 250 \text{ N/mm}^2$. (04)



- b) Find the plastic moment capacity ' M_p ' for the continuous beam shown in figure below. (08)



- c) Analyse the pin jointed plane frame shown in figure below by force method. (08)



- Q6). a) Draw stress diagram of elastic state, elasto-plastic state and fully plastic state for a beam of (04) rectangular cross section.
 b) Derive an expression of horizontal thrust for two hinged parabolic arch subjected to UDL (06) throughout.
 c) Analyse the two storied frame structure laterally loaded as shown in figure using cantilever (10) method. Draw BMD and SFD.

