



4. Design a symmetrical deep beam one half of which is shown in figure 1. It supports two loads kN at 400 mm from supports on each side. Assume  $f_y = 415 \text{ N/mm}^2$ , grade 25 concrete and effective span 1650 mm.

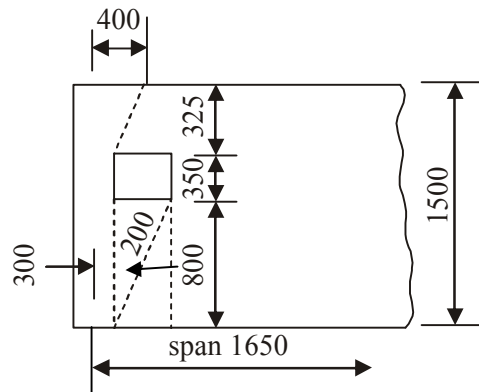


FIG.1

5. A simply supported rectangular slab 4.5 m long and 3 m wide carries an ultimate load of  $15 \text{ kN/m}^2$ . Determine the design moments for case when the moment of resistance of the short span is 30% greater than that in the direction of long span.
6. Explain the portal method for analysing a building frame subjected to horizontal forces.
7. A two span intermediate frame of a multi-storeyed building is shown in figure 2. The frames are spaced at 5 m intervals. The dead load and live load per meter run of the beam may be taken as  $15 \text{ kN/m}$  and  $20 \text{ kN/m}$  respectively. Analyse the frame using two cycle method of moment distribution. If wind loads of  $15 \text{ kN}$  and  $30 \text{ kN}$  are acting at joint A, B and C respectively. Analyse the frame by portal method. Assume that all the columns have equal area of cross section for the purpose of analysis.

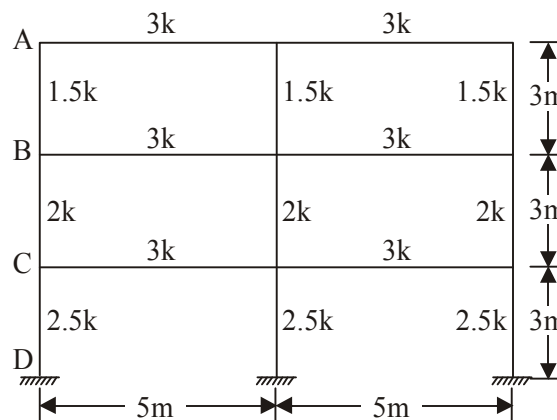


FIG.2

8. A square slab is simply supported on three sides and is free on the fourth side. If the moment capacities are equal in both directions, calculate the collapse load.

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