CE21A - 2000/01
Simple plastic analysis

Qu.1
State the conditions that apply when a structure is on the point of collapse.

Qu.2
In Fig.1 find the ratio of M_p to M_y, where M_y is the moment of resistance when the outer fibres begin to yield. [1.7,1.80]

Qu.3
For the continuous uniform beam shown in Fig.2 find the collapse load W. What would have been the value if ends A and C were fixed?

Qu.4
In Fig.3 establish bounds for the collapse load, p, by assuming plastic hinges at mid-span. Find the exact value of p. [$p = 3.94M_p/L^2$]

Qu.5
A three-span continuous beam has the outer spans each 8m long and the centre span 10m long. The working load is 10kN/m and the load factor against plastic collapse is to be 2.0. Determine the M_p value for each span based on simultaneous collapse in all three spans. [109.8, 140.2 kN-m]

Qu.6
For the beam shown in Fig.4 (i) What load can the beam carry when the stress in the middle just reaches yield and plastic hinges develop at the ends? (ii) What is the mid-span deflection due to this load? (iii) what is the collapse load? Take the yield stress as 50000psi. Take E as 30000psi. [3900lb/in, 0.055in]

Qu.7
Use simple plastic theory to find the plastic moment of resistance of the reinforced concrete beam shown in Fig.5. Take the design strength of the concrete to be 10 N/mm^2 and 400 N/mm^2 for the re-bars. Dimensions shown are in mm. [73.9kN-m]

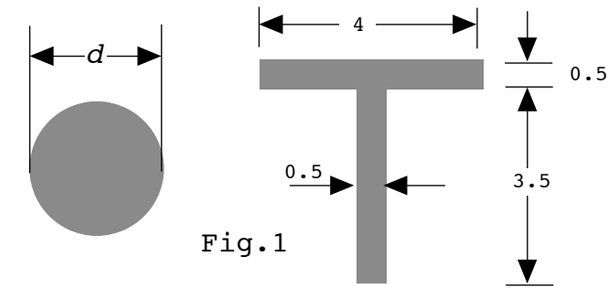


Fig.1

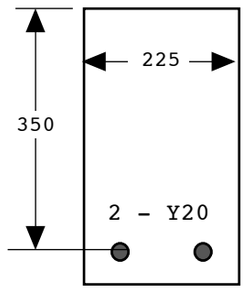


Fig.5

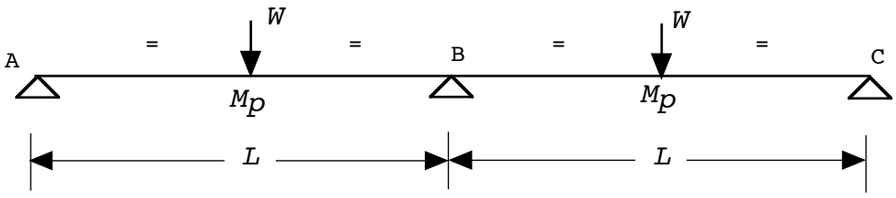


Fig.2

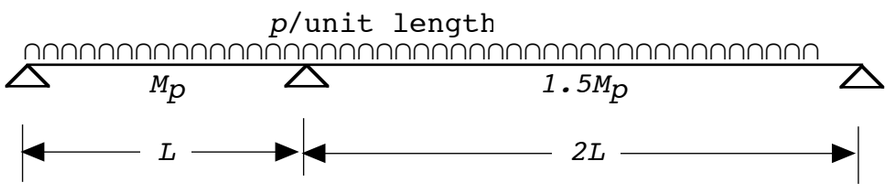
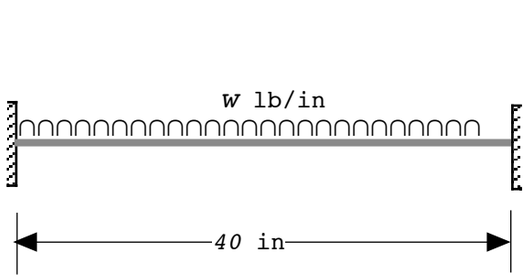


Fig.3



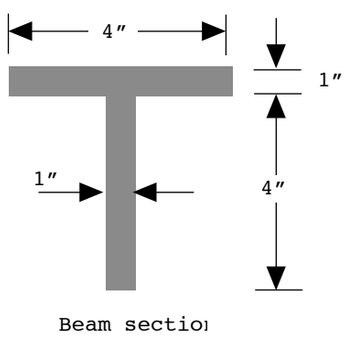


Fig.4

Beam sectio