CEGE0021 – CIVIL ENGINEERING IN PRACTICE

PROBLEM PAPER 2 - DESIGN OF STEEL COLUMNS

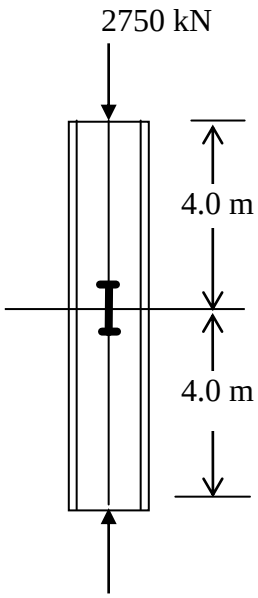
Q1. Select a suitable UC section in grade S275 steel to support axial characteristic permanent and variable loads of 500 kN and 400 kN respectively over a height of 3.8 m assuming that:

(a) both ends are held in position but not restrained in direction

(b) both ends are held in position and restrained in direction

(c) the lower end is effectively held in position and restrained in direction whereas the upper end is not held in position but effectively restrained in direction**.**

Q2. The column shown below is restrained at mid-height about the z-z axis with a tie beam. Assuming the column is pin-ended about both axes and that the load given is the factored axial load, select a suitable section in grade S275 steel.



Q3. A 5.2m long pin-ended column is required to carry a factored axial load of 800kN including self-weight. Check the suitability of a 200 × 100 × 16 hot rolled hollow section in S355 steel with the following properties:

$A = 8300\ mm^2$; $I_y = 367\ 800\ 000\ mm^4$; $I_z = 11\ 470\ 000\ mm^4$; $i_y = 66.6$ mm; $i_z = 37.2$ mm

Q4. The 3.5m long column between Ground and 1st floor shown in FIG Q4 (a) consists of a 254 × 254 × 73 UC in S275 steel. Check its suitability to resist the loads from the floor beams shown in FIG. Q4(b) and a factored axial load of 930 kN from the column between 1st and 2nd floor assuming the latter consists of a 203 × 203 × 71 UC also in S275 steel. Assume the ground floor column is effectively continuous at 1st floor level and the frame is designed on the basis of simple construction.

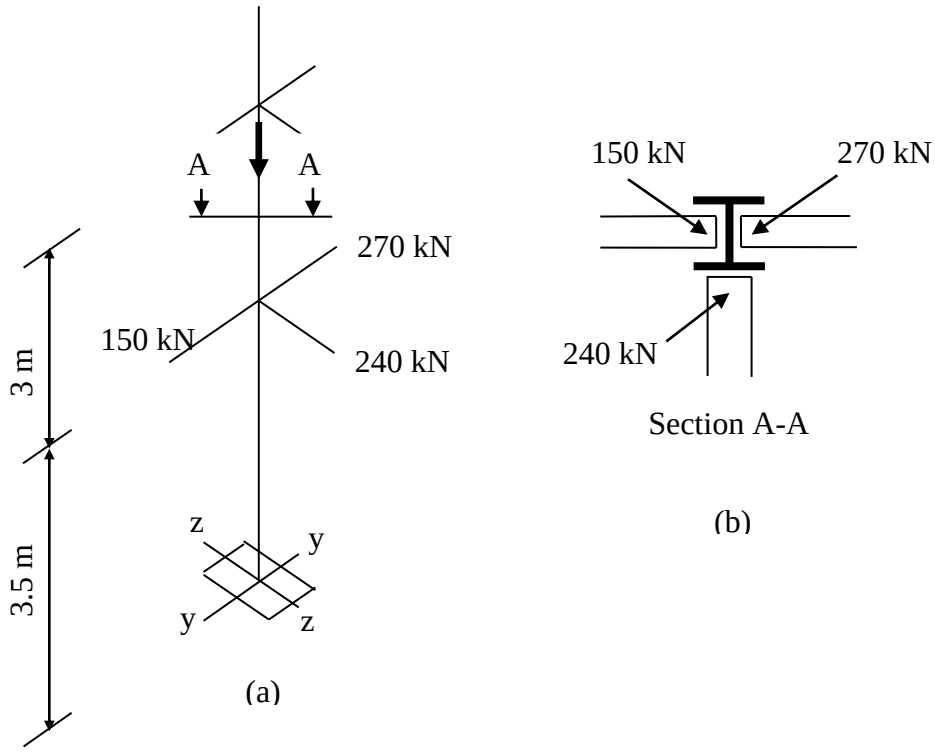


FIG.Q4