Assignment 1 – Design of members subjected to axial loads
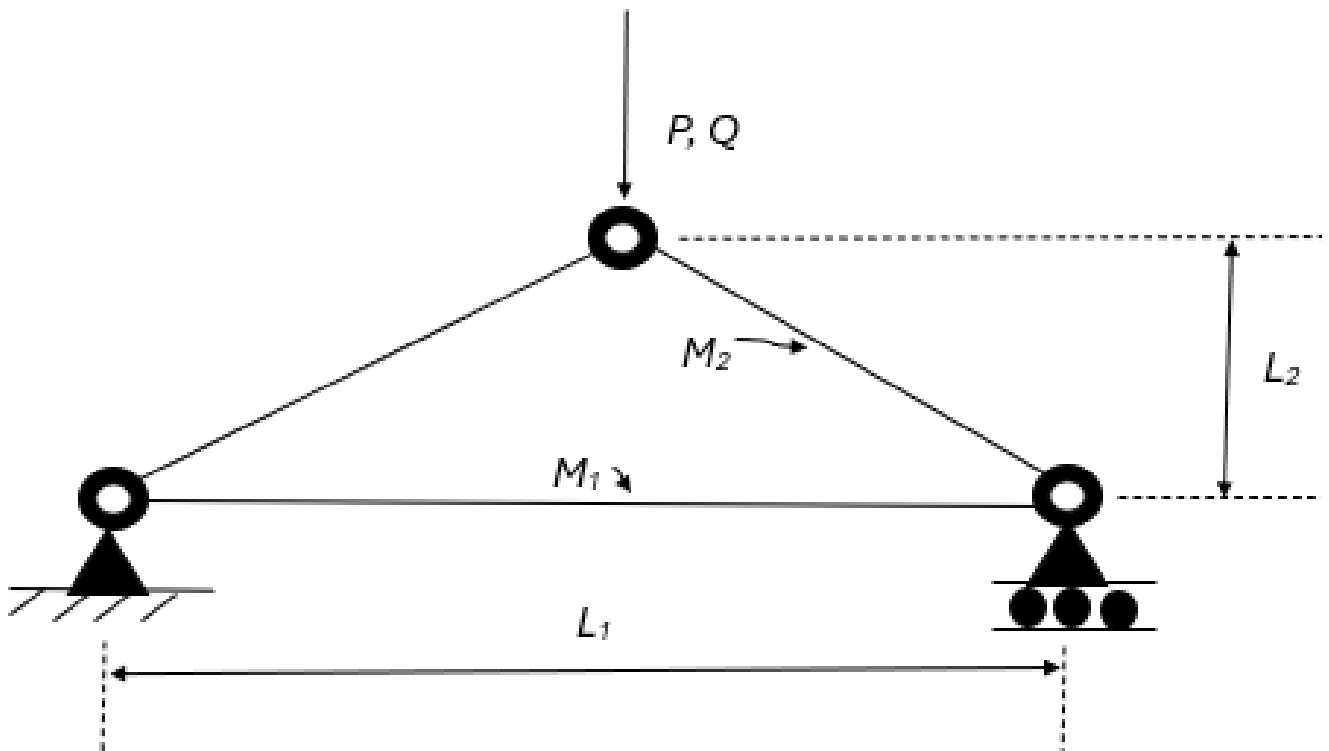

Figure 1: Sketch of steel support structure to be designed

Figure 1 illustrates a sketch of a proposed pin-jointed triangulated steel truss structure of dimensions L_1 and L_2 to support a given load P and Q. You are required to design members, M_1 (length = L_1); and M_2 (length = $\sqrt{\left(L_1/2\right)^2 + L_2^2}$)

Assume:

- All joints are pin-jointed
- All nodes are assumed to be fixed from movement out-of-plane
- All members have a mid-point restraint for buckling out-of-plane
- Member M_1 has a net area in tension of $0.85\,A_g$

Note:

- Choose any steel sections allowable in AS4100
- State any further assumptions
- You do not need to design the connections, merely sketch them based on your chosen section

Design Parameters: Your student number is of the form **zABCDXYZ** and the parameters for your design are given in Table 1. For example, if your student number is **z5412345**, then the parameters for your design are given by your last student number Z as 5.

L_1 = 4.Y m = 4.4 m

L_2 = 4.X m = 4.3 m

P = 700 kN

Q = 750 kN

Table 1: Design Parameters

Last student number Z	L_1 (m)	L_2 (m)	Dead load P (kN)	Live Load Q (kN)
1	4.Y	4.X	500	950
2	5.Y	3.X	550	900
3	6.Y	2.X	600	850
4	7.Y	3.X	650	800
5	4.Y	4.X	700	750
6	5.Y	3.X	750	700
7	6.Y	2.X	800	650
8	7.Y	3.X	850	600
9	4.Y	4.X	900	550
0	5.Y	3.X	950	500

Marking Scheme

The following table provides the overall marking criteria for Assignment 1

1. Calculate the member forces using principles of statics
2. Determine the reactions using the principles of statics
3. Design member, M_1 using AS4100
4. Determine the elongation of member M_1 using mechanics of materials principles
5. Design member, M_2 using AS4100
6. Provide sketches and drawings of the members and connections and how this would be constructed. Please provide comments. You do not need to design the connections, however provide sketches showing the sections and scale of the members and connections. Provide comments on the design and optimisation.

Item	Total Marks
1. Calculate member forces for M_1 and M_2	/15
2. Determine the reactions at the supports	/15
3. Design member, M_1	/15
4. Determine the elongation of member, M_1	/15
5. Design member, M_2	/15
6. Sketches/drawings of member and connections/comments	/25
Overall	/100