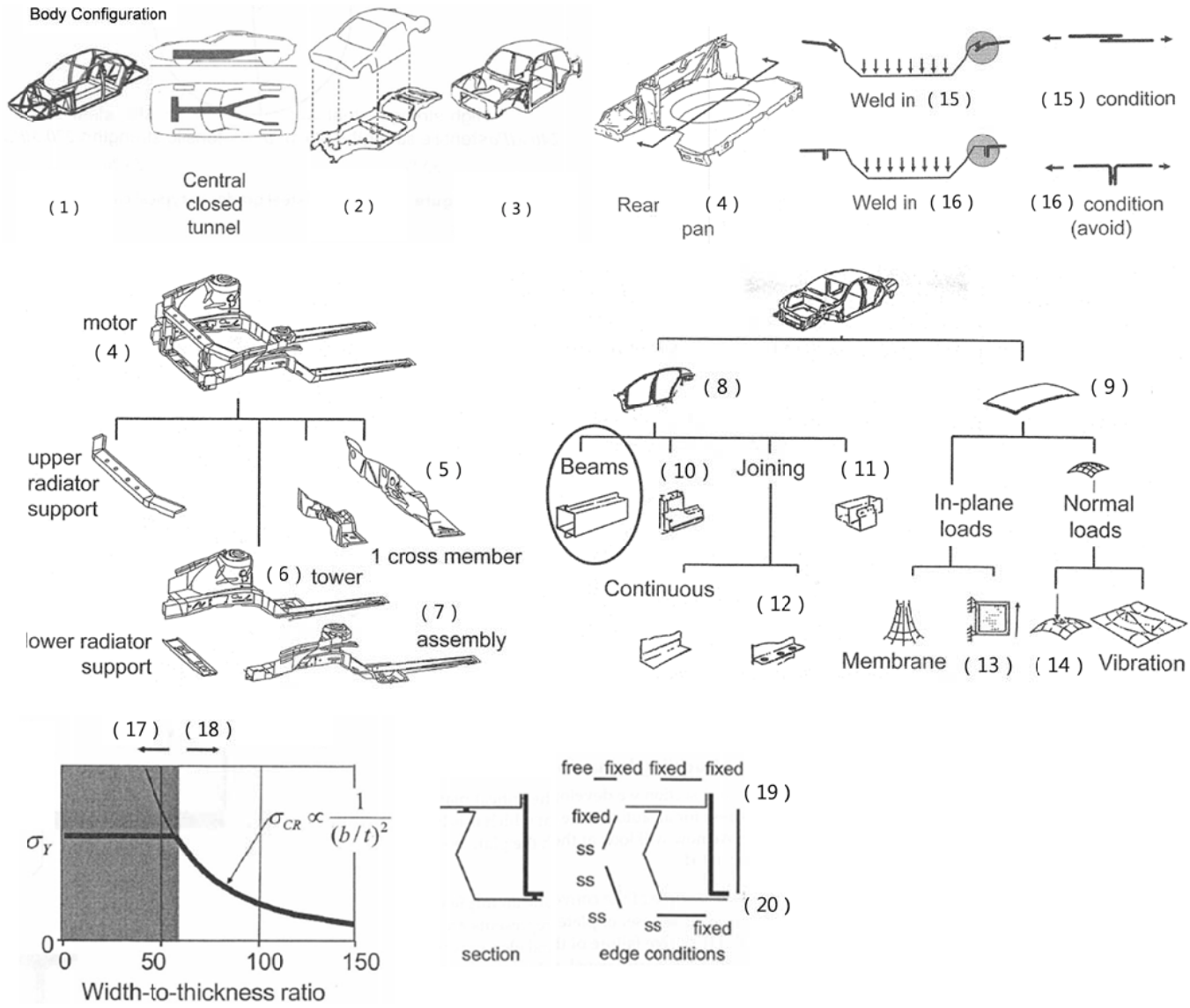
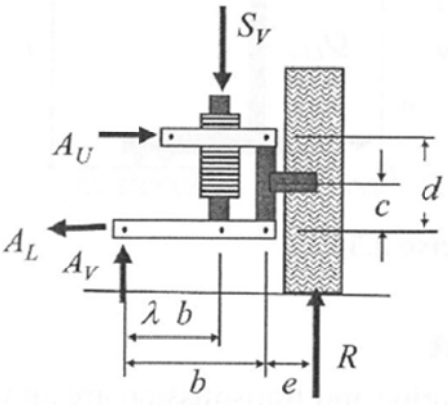
1. Fill in the blanks. (1 pts each)



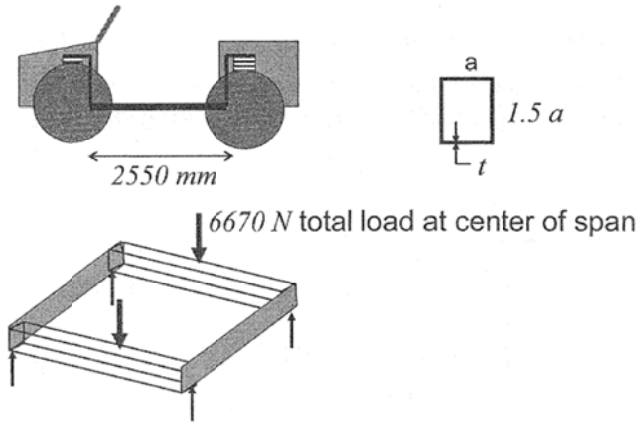
2. For the short-and-long-arm front suspension, the applied load is a maximum bump road, *R*, applied at the tire patch. Derive the expressions for the strength requirements at the structure interfaces. (12 pts)



3. List four characteristics of automotive beams that require analytical tools beyond classical beam theory. (16 pts)

4. Describe techniques to inhibit plate buckling. (12 pts)

5. The desired maximum deflection for the convertible is 1 *mm* elastic under a load of 6670 *N*, or the stiffness requirement is:
$K \geq (6670N)/(1mm) = 6670\,N/mm$
Also the rocker fails at a minimum load of 6670 *N* in yield or buckling. Determine a and t to minimize rocker mass. (20 pts)



$$\begin{cases} \sigma_{yield} = 207\ N/mm \\ \sigma_{buckle} = \dfrac{748355}{(a/t)^2}\ N/mm \end{cases}$$

6. Consider the van box model for torsion.

(1) Determine the shear loads in each panel when $F = 8{,}000N$. (5 pts)

(2) Show that the torsional stiffness of box is $K = \dfrac{T}{\theta} = (2wh)^2 \Big/ \sum_{\text{all surfaces}} \left[\dfrac{ab}{(Gt)}\right]_i$. (10 pts)

(3) What is the torsional stiffness if all panels are perfectly flat steel panels 1mm thick?. (G=80,000N/mm^2) (5 pts)