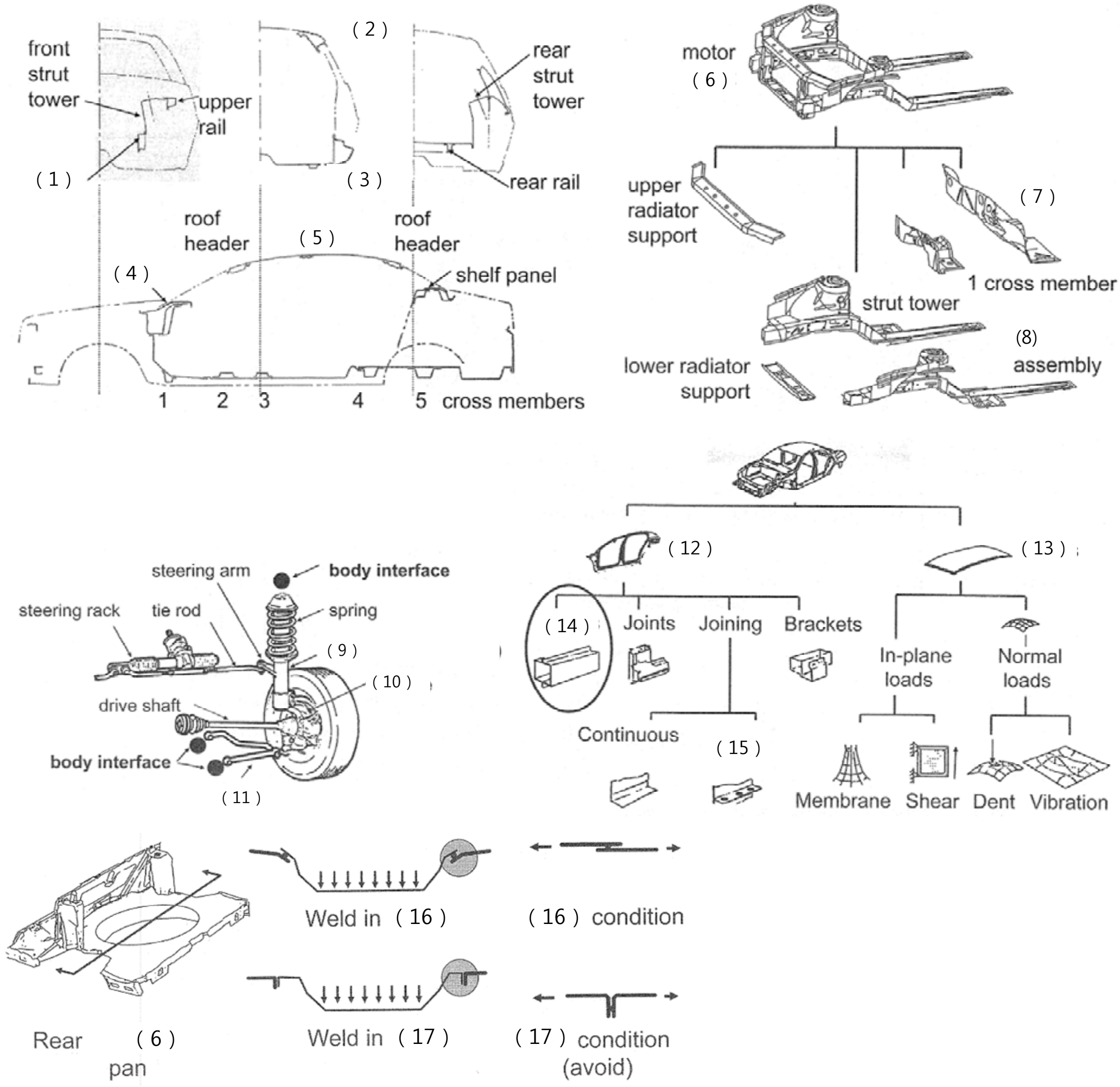
1. Fill in the part names. (2 pts each)



* The difference between expected performance and actual performance for the thinner-walled section is the existence of a new failure mode – (18) of the compressive elements of the section.

* In section design we deal with a trade-off: thick-walled sections with (19) strength but (20) stiffness performance, or thin-walled sections with (19) stiffness but (20) strength performance due to (18).

2. An untreated thin-walled section performs so poorly under a point load. Describe several strategies to reduce the local distortion so that the idealized beam stiffness is more fully utilized. (10 pts)

3. Describe techniques to inhibit plate buckling. (10 pts)

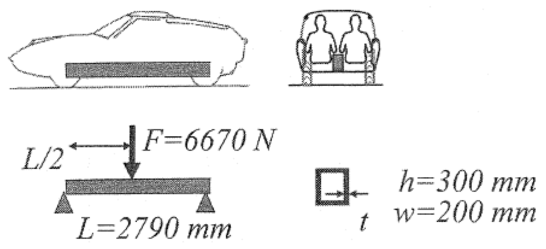
4. One topology for resisting bending load is a back bone beam down the center of the vehicle. The back-bone can be idealized as a uniform beam supported at the axle position. The test load condition is shown. The basic equation for maximum stress is $\sigma = Mc/I$ and for maximum deflection of a center loaded span is $\delta = FL^3/48EI$. The material is steel with $E = 207\times10^3\ N/mm$, $\sigma_{design} = 175\ N/mm^2$.

[Use $I = h^2 t(3b+h)/6$]

(1) What is the minimum thickness to meet the strength requirement of supporting a 6,670 *N* load? (5 pts)

(2) What is the minimum thickness if the deflection at center span is to be at most 1 *mm*? (5 pts)

(3) How short does the wheel base *L* need to be before strength and stiffness criteria require the same thickness? (10 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)