

SE104 Homework 2

1. What is “objective” and what is “constraint”?
2. We are choosing coating material for a structure component. Its density should be around 2 Mg/m^3 and the stiffness must be high. (a) What is the constraint and what is the objective? (b) List 2 free variables that you think may be important. (c) What can this material be?

Hints: 1) You may use Fig.2.9 in Chapter 2. 2) Stiffness is measured by Young's modulus, a.k.a. modulus; a high modulus indicates a high stiffness.

3. We are searching for a material that must be as heavy as possible. In addition, its modulus should be less than 10 GPa. (a) What are the constraint and the objective? (b) List 2 free variables that you think may be important. (c) What can this material be?
4. We are choosing material for an architectural part. The cost must be below \$10/kg. The stiffness must be as high as possible. The density should be less than 2 Mg/m^3 . It must be transparent, with the visual transmittance (the amount of visible light that can pass through it) more than 70%. (a) What are the constraints and objectives? (b) List 2 free variables that you think may be important.

Bonus question: What are the major parameters that describe the structural (mechanical) properties of a material? Briefly describe their meanings. Hint: Chapter 1 gives this information.