

Module 1 – Basics

Sample Questions

1. “Cost often limits the targeted performance of the material.” Explain
2. Why is it necessary to get information about a material from different levels or scales?
3. Explain how the minimum representative volume affects the size of a material sample to be tested in the engineering level.
4. Why is work to fracture (or fracture toughness or fracture energy) important?
5. Name three materials that are more brittle (i.e., having a lower fracture toughness) than structural steel.
6. Derive the criterion for minimizing the weight of a simply supported beam with a uniformly distributed load for the required stiffness. Take the cross-section to be rectangular. Use the tables given to find the best material for such an application.
7. Derive the criteria for minimizing weight and cost of a post (with a circular cross-section) with a very heavy mass on top for the required strength and axial deformation. Use the tables given to find the best material for such an application.
8. Why would you expect structural steel to have a much lower variability in its mechanical properties than timber?
9. Strength tests show that material A has a mean strength of 400 MPa with a co-efficient of variation of 12% whereas material B has the same strength with a co-efficient of variation of 23%. Material B is marginally cheaper than material A. Which material would you choose and why?
10. What is the relation between the characteristic and mean strengths? What is the significance of the parameters that figure in this relation?