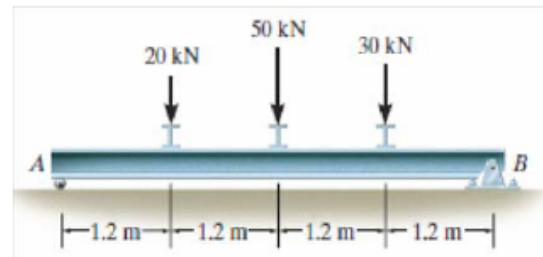# ME 304 Mechanical Engineering Design (1)

Homework(1)

Q1

Select the shortest and lightest-weight steel wide-flange beam from Appendix B that will safely support the loading shown. The allowable bending stress is $\sigma_{allow} = 160$ MPa, and the allowable shear stress is $\tau_{allow} = 84$ MPa.

Q2

The timber beam has a rectangular cross section. If the width of the beam is 150 mm, determine its height h so that it simultaneously reaches its allowable bending stress of $\sigma_{allow} = 10$ MPa and an allowable shear stress of $\tau_{allow} = 0.35$ MPa. Also, what is the maximum load P that the beam can then support?
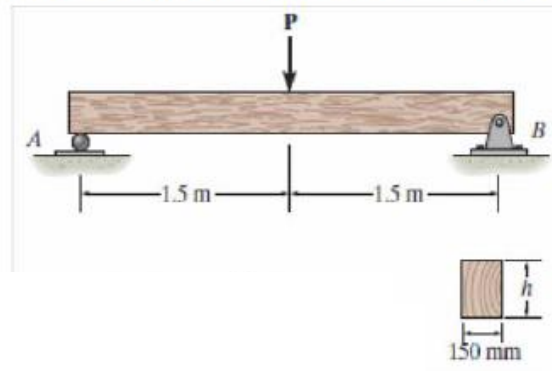
Q3

The bearings at A and B exert only x and z components of force on the steel shaft. Determine the shaft's diameter to the nearest millimeter so that it can resist the loadings of the gears without exceeding an allowable shear stress of $\tau_{allow} = 80$ MPa. Use the maximum-shear-stress theory of failure.