

MMAN2300 Engineering Mechanics 2

Part A: Vibration Analysis

Tutorial 5

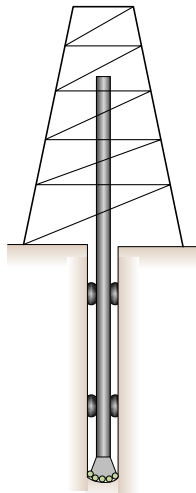
Question 1

A 1.5m long steel cord is fixed at its ends. It has a diameter of 1.5 mm, a density of 7800 kg/m^3 , and a fundamental natural frequency of 125 Hz. What is the tension in the cord?

[1938 N]

Questions 2-4

The shaft of an oil drill shown below is made of steel with Young's modulus $E = 2.1 \times 10^{11} \text{ N/m}^2$, diameter $d = 0.3 \text{ m}$ and density $\rho = 7800 \text{ kg/m}^3$. The drill has a total length of 1500 m. It is fixed at the upper end and free at the lower end. Find the first three natural frequencies (in rad/s) for longitudinal vibration of the drill.



[5.43 rads, 16.3 rad/s, 27.2 rad/s]

Question 5

A 3.4 kg mass is suspended by a 1mm diameter steel wire of length 0.8 m. What is the natural frequency of the system?

[46.1 Hz]