SOLVE BOTH PROBLEMS

1. The system shown consists of three equal masses connected by a massless rod and three identical springs. Determine the natural frequencies and associated mode shapes of vibration. Consider only small vertical motions of the masses and neglect the effect of gravity.
2. The uniform steel beam of mass $m$ and length $l$ is suspended in the horizontal position shown by the two cables at $A$ and $B$. If the cable at $B$ suddenly breaks, determine the tension $T$ in the cable at $A$ immediately after the break occurs. Treat the beam as a slender rod. The acceleration due to gravity is $g$. 

![Diagram of the beam and cables](image)