

MECH 230 Dynamics

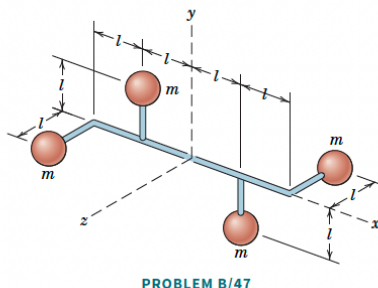
Homework 8

Dr. Theresa Honein

Due Wednesday November 20, 2024

1. Read the problem statement of MKB B/047.

B/47 Determine the products of inertia about the coordinate axes for the unit which consists of four small particles, each of mass m , connected by the light but rigid slender rods.



PROBLEM B/47

Label the particles 1, 2, 3, 4 going from left to right and take the $\{\mathbf{E}_x, \mathbf{E}_y, \mathbf{E}_z\}$ basis to be along the directions shown.

2. Write the expressions for the position vectors \mathbf{r}_i , $i = 1, \dots, 4$ in terms of l .
3. Verify that the center of mass of this body is at the origin.
4. Recall that for a continuous body, its product of inertia about its center of mass are

$$I_{xy}^C = \int_B xy dm, \quad I_{xz}^C = \int_B xz dm, \quad I_{yz}^C = \int_B yz dm,$$

where for a typical material point on the body with mass dm . Its position vector from the center of mass is $\mathbf{r} - \mathbf{r}_C = x\mathbf{E}_x + y\mathbf{E}_y + z\mathbf{E}_z$.

5. Calculate the products of inertia about C for this system of particles.