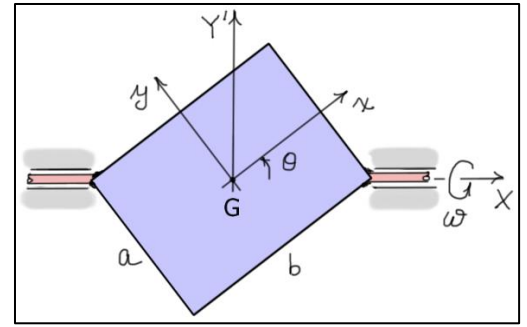
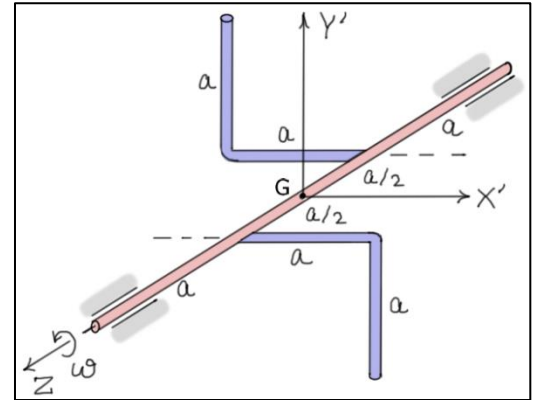


**ME 5550 Intermediate Dynamics**  
**Exercises #6**

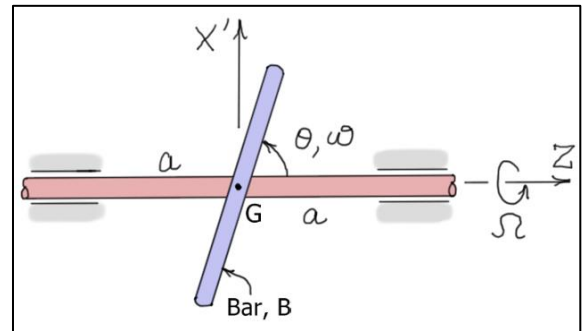
1) The rectangular plate  $P$  is welded to a shaft, so it rotates about its diagonal. (a) Find  $\underline{H}_G$  the angular momentum of  $P$  about its mass-center  $G$ . Express the results in the  $X$ ,  $Y'$ , and  $Z'$  shaft-fixed directions. (b) Find  $K$  the kinetic energy of the plate.



2) The system shown consists of two L-shaped arms welded to a shaft of length  $3a$ . The planes of the arms are at right-angles to the shaft. Complete the following assuming all parts are made of "slender" bars. (a) Find  $\underline{H}_G$  the angular momentum of the system about its mass center  $G$ . Express the results in the  $X'$ ,  $Y'$ , and  $Z$  shaft-fixed directions. (b) Find  $K$  the kinetic energy of the system.



3) The system shown consists of a bar  $B$  that is pinned through the center of a shaft of length  $2a$ . As the shaft rotates about the  $Z$ -axis at a rate  $\Omega$  (r/s),  $B$  rotates about the  $Y$ -axis (normal to the plane of the diagram) at a rate  $\dot{\theta} = \omega$  (rad/s). (a) Find  $\underline{H}_G$  the angular momentum of  $B$  about its mass center  $G$ . Express the results in the  $X'$ ,  $Y'$ , and  $Z$  shaft-fixed directions. (b) Find  $K$  the kinetic energy of  $B$ .



4) The system shown consists of a bar  $B$  that is pinned to the bottom of a disk  $D$ . As the disk rotates at a rate  $\Omega$  (rad/sec) about the  $Z$ -axis, the bar rotates at a rate  $\dot{\theta}$  (rad/sec) about the  $X'$  direction (normal to the plane of the diagram). (a) Find  $\underline{H}_G$  the angular momentum of  $B$  about its mass-center  $G$ . Express the results in the  $X'$ ,  $Y'$ , and  $Z$  disk-fixed directions. (b) Find  $K$  the kinetic energy of  $B$ .

